MECHANICAL ENGINEERING

· JANUARY 1950 ·

Departments

MORE!

◎ Branch Office
• Resident Sales-Service Engineer

In Canada: Montreal, Halifax, Toronto, Winnipeg, Vancouver

More Power per fuel dollar

—that's the basic business of Bailey Meter Company. Our products and services are designed to deliver increased power plant efficiency for you, whether your plant is large or small. We have had a wealth of experience on every size and type of steam generating equipment.

Here are some of the reasons why we believe we have more to offer you in this field than any other single manufacturer.

More Complete Range of Equipment

Our fully co-ordinated line of Meters and Controls is offered for a wide variety of services and in a complete range of types. This means you need never worry that a Bailey Engineer's recommendation is slanted in favor of a particular type of equipment merely because he is unable to offer the exact one best suited to your needs. It means, too, that you need never fear a buck-passing division of responsibility for the efficient operation of your complete boiler control system.

More Experienced Engineering Service

When you discuss your power plant problems with a Bailey Sales-Service Engineer, you get advice from an organization with a background of more knowledge and experience in steam plant operation than any other manufacturer of instruments and controls can offer you. Our field representatives are graduate engineers with specialized training in combustion, flow measurement and automatic control. Each has completed an intensive course in theory and practice at our plant before being given a field sales-service assignment.

More Direct Sales-Service Offices

Bailey Meter Company's sales-service engineers are located in more industrial centers than those of any other manufacturer of boiler control systems. Truly, prompt and capable service—and with a minimum of travel time and expense—is as near as your telephone. In emergencies a trained Bailey Engineer is available in a matter of minutes or a few hours at the most.

Giving More Power to You

Better power plant operation calls for more power per fuel dollar, less outage, and safer working conditions. We help you to get all of these. Write for Bulletin 15G describing Bailey Meters and Control Systems.

G-30-1

BAILEY METER COMPANY

BAILEY METERS

1026 IVANHOE ROAD, CLEVELAND 10, OHIO • BRANCH OFFICES IN PRINCIPAL CITIES

BAILEY METER COMPANY LIMITED, MONTREAL, CANADA

GIVING MORE POWER TO YOU

The bare facts about ball bearings

Cut-away view of New Departure Ball Bearing

Rugged New Departure Ball Bearings lick friction with free-rolling, tough, forged steel balls.

They welcome today's more exacting requirements of higher speeds, heavier loads and *continued* precise positioning of moving parts.

And . . . most important of all, New Departure, world's greatest ball bearing maker, meets your particular problems with a vast fund of experience and *original thinking*.

1

Nothing Rolls Like A Ball. It is nature's favorite, strongest form. Having no ends, it rolls freely in any direction.

2

Under heavy compression it deforms slightly and then resumes its original form. Made of the toughest, most resilient steel known to man, the New Departure steel ball is of uniform structure throughout.

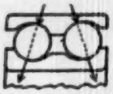
3

Its inherent resistance to load is greatly increased by curved raceways which, under load, are nearly filled by an arc of the ball. "Point contact" talk is the bunk. Actually, its contact is an ellipse, like this:

4

This is how a ball resists thrust (axial loads) as well as radial loads — like a bicycle on a banked track.

5



Put two rows of balls together, and you can support thrust and radial loads from any direction. They may be in one single bearing or in two separate bearings.

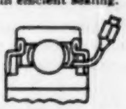
6

Unlike other types of rolling elements, the ball need not be forced to travel in the proper direction. Function of separator is merely to keep balls spaced. Contact is at poles (point of slowest rotation—least friction.)

7

Only ball bearings may be self-sealed with integral closures of felt and metal. In average conditions New Departures are lubricated for life. Other type bearings cannot maintain precise "inter-fitment" needed to maintain efficient sealing.

8



Newest new departure by New Departure: Lubrication in new sealed bearings may be revitalized by injecting with hollow needle on pressure oiler—without removal of seals or need for nipples, grease passages, plugs.

Nothing Rolls Like a Ball

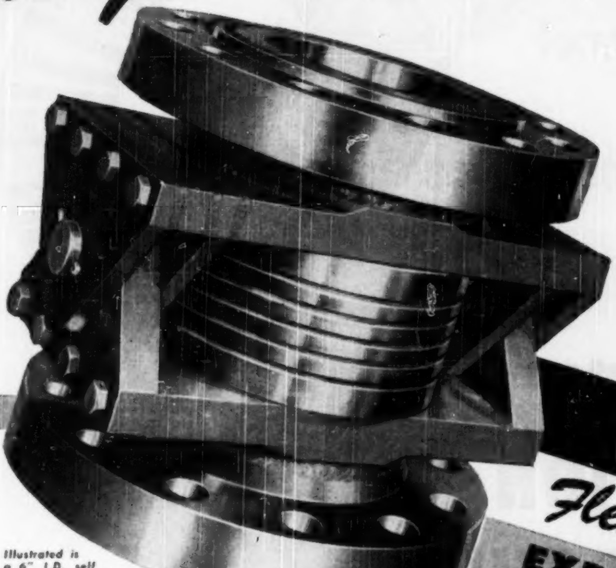
NEW DEPARTURE
BALL BEARINGS

NEW DEPARTURE • Division of General Motors • BRISTOL, CONN. • Branches in DETROIT • CHICAGO • and Other Principal Cities

MECHANICAL ENGINEERING, January, 1950, Vol. 72, No. 1. Published monthly by The American Society of Mechanical Engineers, at 20th and Northampton Sts., Easton, Pa. Editorial and Advertising departments, 29 West 39th St., New York 18, N. Y. Price 75¢ a copy, $7.00 a year; to members and affiliates, 50¢ a copy, $4.00 a year. Postage to Canada, 75¢ additional, to foreign countries $1.50 additional. Entered as second-class matter December 21, 1920, at the Post Office at Easton, Pa., under the act of March 3, 1879. Member of the Audit Bureau of Circulations.

 For Editorial Contents See Page 1

Now you can have... perfected motion control for piping systems at pressures up to *1000 psi!



CMH *Flexoniflex* EXPANSION JOINTS

Illustrated is a 6" I.D. self restrained Flexoniflex unit designed to correct radial motion in a 700 psi. system. Other units are available to absorb the various other types of motion encountered in high pressure piping.

For power and process applications (and others, too) at working pressures up to *1000 psi., CMH offers perfected control of axial, offset and/or radial motion with Flexoniflex Joints. Whether the motion results from expansion and contraction, vibration, or most any other cause, CMH Flexoniflex Joints are the answer. Made by revolutionary methods in a variety of styles and tested and proved in the laboratory and the field, CMH Flexoniflex Joints open a complete new phase of high pressure piping.

Standard Flexoniflex units consist of a stainless steel pressure carrier, single or multiple ply, lined or unlined, with integral reinforcing rings. They may be used at temperatures from sub-zero to 1400° F. (higher with special materials).

Whatever your high pressure piping problems, CMH engineers will welcome the opportunity to make specific recommendations as to motion control. Just send an outline of your requirements.

**1000 psi. is a nominal pressure limitation. Flexoniflex units have been and will be designed and made for pressures well in excess of this.*

CMH—ONE dependable source for every flexible metal hose requirement

• CMH manufactures all standard types of flexible metal hose, both convoluted and corrugated, in a variety of metals; expansion joints for piping systems; stainless, steel and brass bellows; various conduits and special assemblies of these components.

CHICAGO METAL HOSE CORPORATION

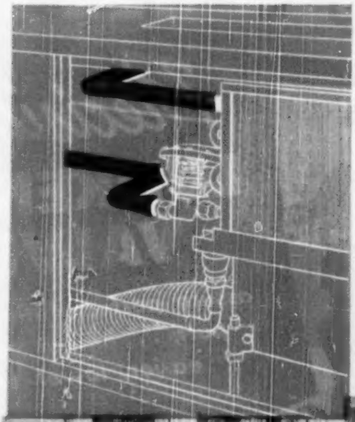
Leaders in the Science of Flexonics
1305 S. Third Avenue
MAYWOOD, ILLINOIS
Plants at Maywood, Elgin and Rock Falls, Illinois
In Canada: Canadian Metal Hose Co., Ltd., Brampton, Ontario

FLEXON . . . . . identifies CMH products which have served industry for more than 47 years

to an imaginative engineer...

this basic *Spongex*® form

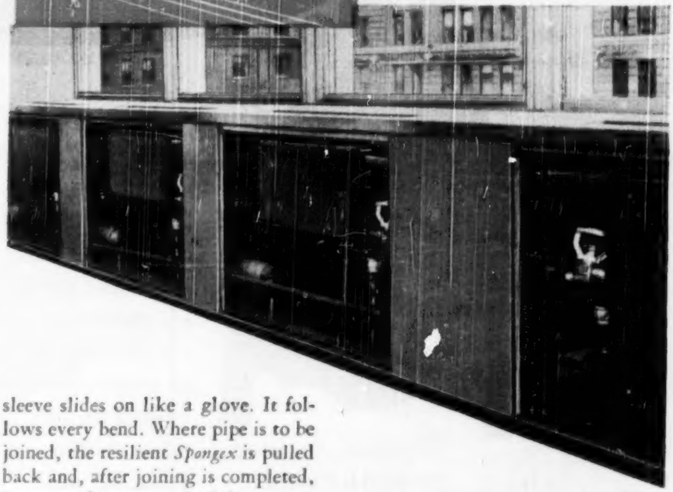
yielded this idea



to become this application

in this climate control development

Air conditioning system installation by Kerby Saunders, Inc., at 100 Park Avenue, New York. George A. Fuller Company, General Contractor. Kahn & Jacobs, Architects. Jaros, Baum & Bolles, Consulting Engineers.



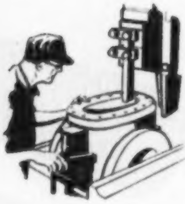
Cellular rubber does not become a "product" until you make it one in *your* application of its known qualities as insulation against shock, vibration, sound and air and temperature transmission. Thus, one of many basic forms of *Spongex* cellular rubber becomes a covering for copper tubing in the application made by Kerby Saunders, Inc., New York, mechanical contractors.

With *Spongex*, they overcome condensation and provide insulation in air conditioning unit feed and return lines. And they do so with the least expenditure of costly time and effort. No adhesives are needed. The simple sleeve slides on like a glove. It follows every bend. Where pipe is to be joined, the resilient *Spongex* is pulled back and, after joining is completed, is returned to cover the joint.

In every industry there exist problems that *Spongex* cellular rubber may solve. Think about it. If your thoughts are on vibration, insulation, cushioning, gasketing, sealing or sound damping, we can be your greatest help.

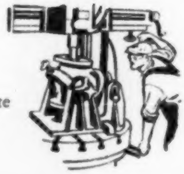
THE SPONGE RUBBER PRODUCTS COMPANY

129 Derby Place, Shelton, Conn.



A DISTINCTIVE FEATURE IN DISC GUIDING

Body guides are machined down to precision tolerances, assuring a perfect guide for the disc and creating a positive center line on which all subsequent machining operations are based.



BODY PRECISION MACHINED TO INSURE PERFECT FIT OF SEAT RINGS

This operation makes inserting the seat rings in a Lunkenheimer gate valve simply a matter of screwing them into position. Parts can be replaced without any machine work or special fitting.

Fig. 1430
Iron Body Gate Valve

Fig. 1430 and complete line of I.B.B.M. and All Iron Gate Valves are described in Circular 564. Mailed upon request.

Precision Made LUNKENHEIMER VALVES....

assure perfect-fitting, interchangeable parts . . . longer valve life . . . easier, lower-cost maintenance!

THE smooth working efficiency and low maintenance cost of Lunkenheimer Valves were not "made in a day." Behind this superior performance and economy lies long experience, top engineering and metallurgical facilities together with the most modern manufacturing equipment.

Lunkenheimer Valves have a streamlined simplicity of design . . . a minimum of working parts, each part of extra strength, correctly proportioned and perfectly balanced. This assures longer life with lower maintenance expense.

Depend on your **LUNKENHEIMER DISTRIBUTOR** *for service and reduced valve inventory!*

Many concerns, large and small, have found real savings by depending on the complete stocks of Lunkenheimer Distributors. Capital formerly tied up in slow-moving inventory is available for other uses; losses from obsolescence are eliminated or drastically reduced. Ask your Distributor how he can help you.

ESTABLISHED 1862

THE LUNKENHEIMER CO.

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NEW YORK 13 · CHICAGO 6 · BOSTON 10 · PHILADELPHIA 34

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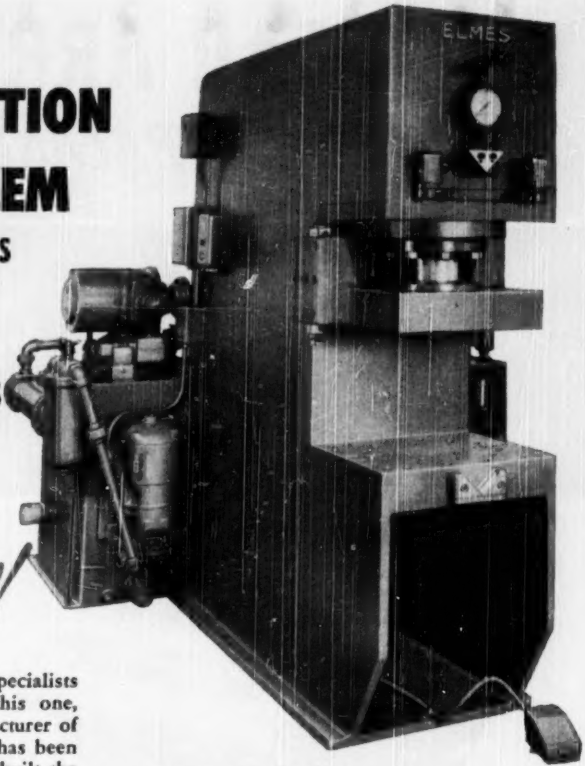
HERE'S A TOUGH MULTIPLE-OPERATION PROBLEM



PERFORMS 3 OPERATIONS PER CYCLE—
Shearing, Riveting and Straightening
ON FORGED STEEL PARTS
at 35 Cycles per Minute

Solved by Elmes!

For nearly a century, Elmes hydraulic specialists have been solving problems such as this one, brought to Elmes by a prominent manufacturer of farm implements. Each problem in turn has been met with the characteristic ingenuity that built the Elmes Press reputation for excellent performance.

Shearing, riveting and straightening forged steel work— *subject to variations in thickness*—on a single stroke of a press, call for proper application and accurate regulation of pressure. To meet these requirements, Elmes supplied the 100-ton Automatic Openside Press shown above—and turned several troublesome, costly procedures into one smooth, fast, profitable operation. This 3-way operation is being performed unfailingly at speeds up to 35 cycles per minute.

Why not put your pressing problems up to Elmes? Objective engineering, backed by many years of successful hydraulic experience, makes Elmes Presses right for each job. Our staff of specialists is at your service with suggestions, recommendations or cost estimates on existing press designs or new developments—without obligation on your part.

ELMES 100-TON AUTOMATIC OPENSIDE PRESS

Moving platen, 18" x 16". 3" stroke. High and low pressure pump provides rapid advance, slower pressing speed and rapid return. Photo-electric safety control stops platen immediately if obstruction breaks light beam at entrance to dies. Accessible, fast, flexible. Sizes and capacities for all service needs.

DO YOU HAVE THIS ELMES HYDRAULIC METAL-WORKING PRESS BULLETIN?

Covers single-action, double-action and triple-action presses; standard designs; special applications; automatic feeds. Your Elmes distributor can supply you, or request direct. Ask for Bulletin No. 1010B.

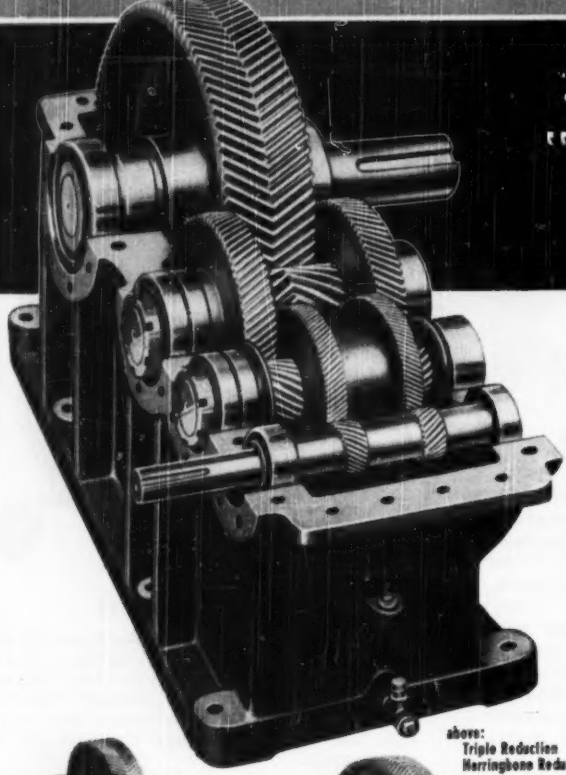
ELMES ENGINEERING DIVISION OF AMERICAN STEEL FOUNDRIES

Distributors in Principal Industrial Centers — *Also Manufactured in Canada*

NEW PLANT ADDRESS — 1150 Tennessee Avenue CINCINNATI 29, OHIO

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES

THIS GEAR ARRANGEMENT
GIVES PERFECT BALANCE & SYMMETRY

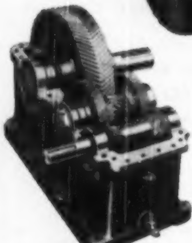


. . and Bearings
"Share the Load"
Equally

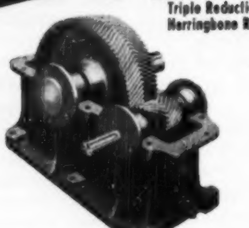
..another feature of

Philadelphia
HERRINGBONE
Speed Reducers

above:
Triple Reduction
Herringbone Reducer



Double Reduction Herringbone Reducer

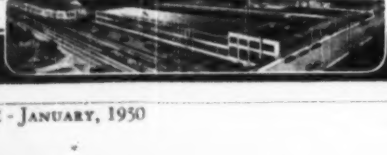


Single Reduction Herringbone Reducer

• Just one of the well planned construction features of these widely used Reducers, is the "Gear Arrangement" in the Double and Triple Reduction Type . . . the gears are located symmetrically in relation to the centerline of the housing, rather than the usual offset arrangement. It will be noted that 2 standard bearings are used on each shaft and *each bearing absorbs an equal load.* (In comparison to the offset arrangement of Herringbone Gears, which result in unequal bearing loads, while similar arrangement of single helical gears impose an additional load by the thrust action) . . . It is evident then, that Philadelphia Herringbone Reducers with double helical gears spaced equidistant from the bearings in the first and intermediate reductions, with a continuous tooth herringbone gear set on the centerline for final reduction, *provide perfect balance and symmetry.*

For complete construction details, get our Catalog H-49. Please write on your Business Letterhead.

Philadelphia Gear Works, INC.



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NEW YORK • PITTSBURGH • CHICAGO • HOUSTON
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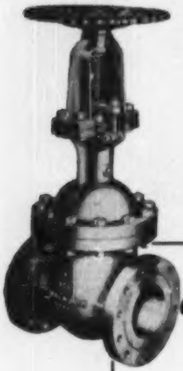
Industrial Gears and Speed Reducers
LimiTorque Valve Controls

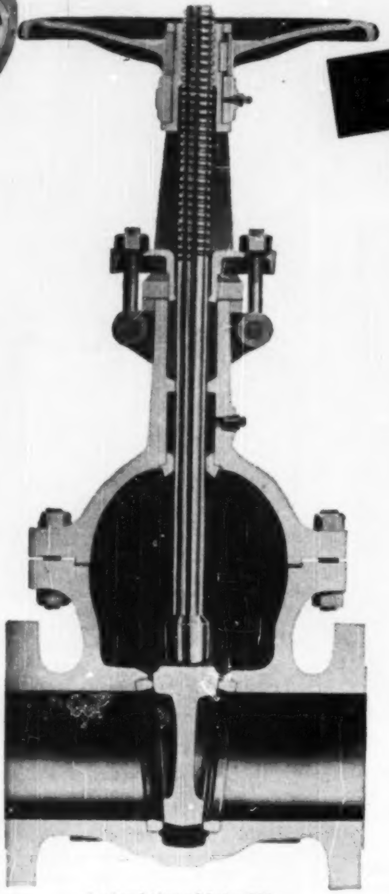
WALWORTH



Cast Steel Gate Valves

Series 150 and 300

Wedge Gate — Outside Screw and Yoke



Sectional view of Series 300

Big 8-Point Superiority!

Gland clearances are such that stem cannot be scored if gland should be tightened unevenly.

Deep Stuffing Boxes in all sizes (2″ to 24″) insure tightness and maximum packing life — costly leaks are eliminated.

Bonnets and Bodies are engineered to withstand pressure and minimize distortion — they're tough, durable, dependable.

Heavy Steel Walls provide extra strength and longer life.

Integral Body Guide Rib Faces are machined to insure accurate disc seating.

Seat Rings are bottom seated — not flange type. No recess exists at back of ring — hence no turbulence, erosion, or pressure drop.

Streamlined Ports allow high velocity, non-turbulent flow, and reduce the possibility of erosion.

Valves regularly have flanged ends. They can be supplied with ends for butt welding. Roller bearing yokes are available. On valves 5 inches and larger, by-passes can be furnished.

For Series 600 and higher, we recommend Walworth Pressure-Seal Steel Gate Valves.

For further information on Walworth Cast Steel Gate Valves, see your local Walworth distributor, or write:

WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

Research Laboratory of S. C. Johnson & Son, Inc., with tubular-glass-walled wax research tower now under construction. Frank Lloyd Wright, Architect. Samuel R. Lewis, Consulting Engr.

Air OF RESEARCH

RESEARCH: "Critical and exhaustive investigation having for its aim the discovery of new facts and their correct interpretation . . ."—*Webster.*

THE constant search for ways to develop and improve products is one of many ways in which "Buffalo" Fans team up with industry! An "experiment in behalf of the American housewife", the famous new Johnson wax research tower will enjoy air completely free of dirt and dust—a "must" for Johnson standards of product purity.

Hundreds of leaders like S. C. Johnson & Son have picked "Buffalo" fans to help make a better product. And many more firms are using these efficient, quiet-running fans on scores of other profitable uses—for comfort, for safety, for product and process control—for *better productivity and increased profits!*

Why not put the air in *your* plant to full use? Your nearby "Buffalo" engineering representative will give you all the facts. Call him, at no obligation.

"Buffalo" Belted Vents provide compact units for industrial and commercial ventilation

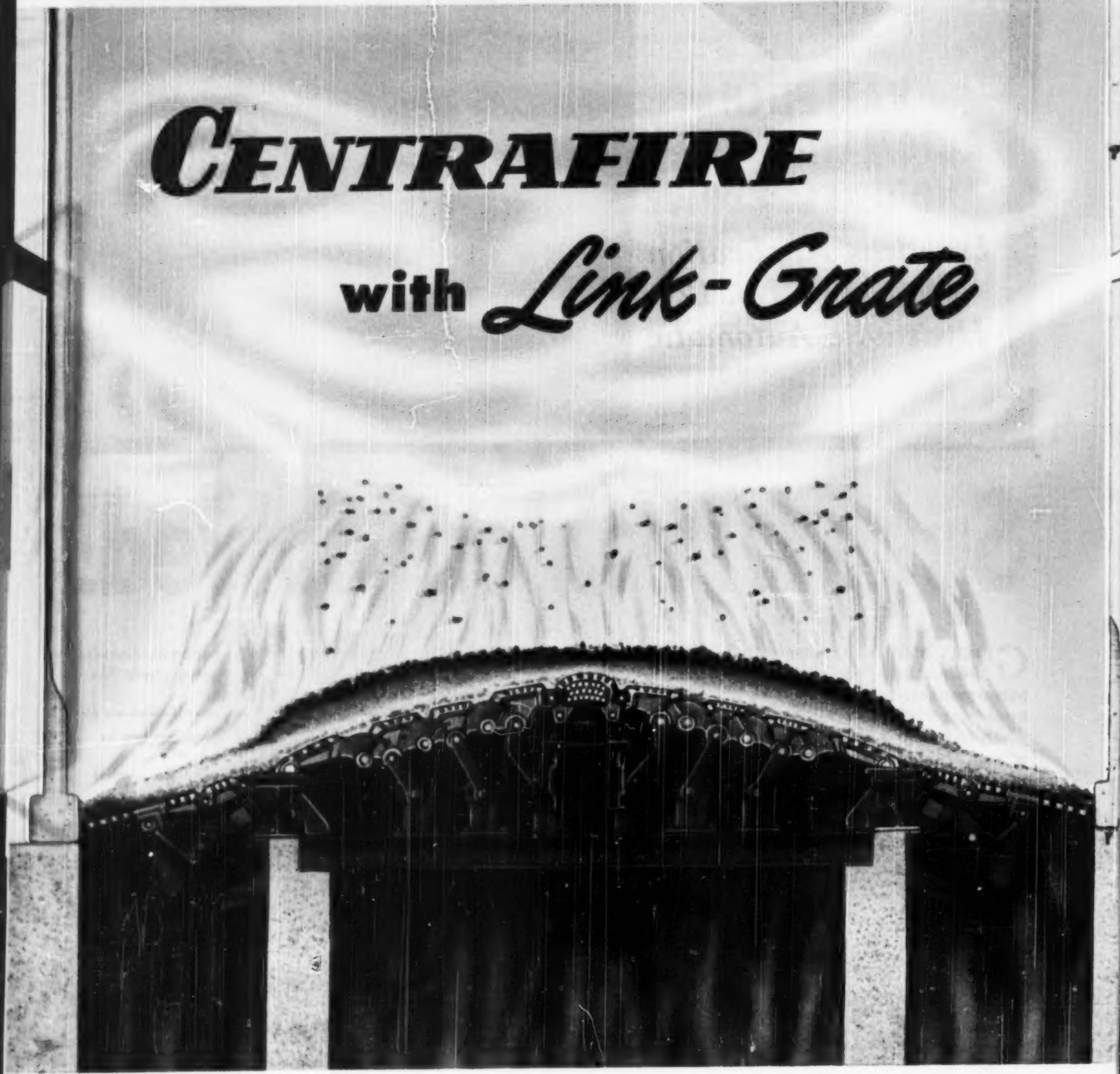
"Buffalo" FIRST FOR FANS

BUFFALO FORGE COMPANY

148 MORTIMER ST. BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

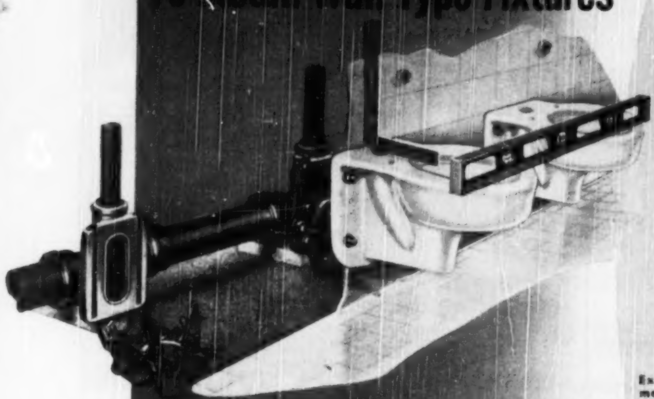
Branch Offices in all Principal Cities


CENTRAFIRE
with Link-Grate

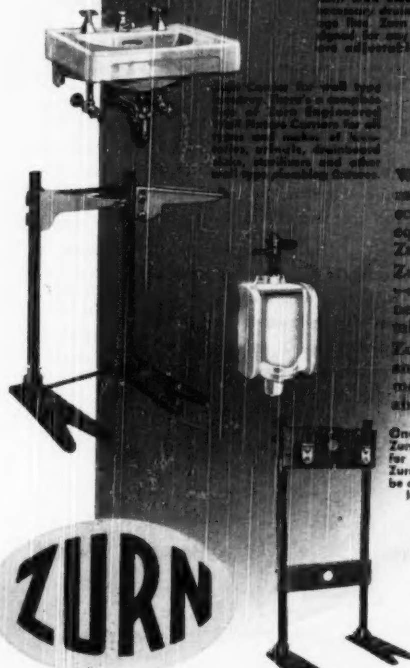
IF THERE EVER WAS A REASON FOR NOT USING WALL TYPE FIXTURES, IT NO LONGER EXISTS!

ZURN *found*

The Simple, Fast, Safe Way To Install Wall Type Fixtures



A battery of siphon jet closets installed with Zurn Wall Closet Fittings, which provide all necessary drainage facilities up to the drainage line. Zurn Wall Closet Fittings are designed for any type or make of fixture and are adjustable to most any wall space.



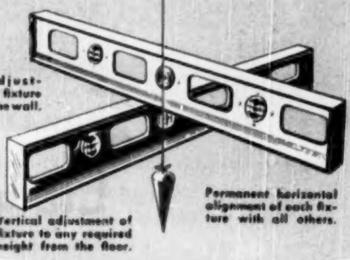
[illegible] Carrier for wall type lavatory. There's a complete line of Zurn Engineered Wall Fixture Carriers for all types and makes of lavatories, urinals, drainboard sinks, [illegible] and other wall type plumbing fixtures.

THE [illegible] WAY

Perfect Alignment

IN ALL THREE DIRECTIONS

Obtained with Exclusive Adjustment Features of Zurn Carriers... For the Support of All Types and Makes of Wall Fixtures



Wall type fixtures achieve a higher standard of sanitation, and save maintenance money. With clear, unobstructed floor areas, cleaning is quicker, easier, more economical. Their use does not leave a building that is otherwise well planned and equipped vulnerable to premature obsolescence. Wall type fixtures installed with Zurn Engineered Carriers impart no damaging strain to the finished wall.

Zurn Wall Closet Fittings and Carriers are engineered to support wall type fixtures off the floor, free of the wall—safely, securely, and in permanent alignment. All necessary adjustments are simple; assembly and installation are fast—free of mistakes, delays and grief on the job.

Zurn Wall Closet Fittings and Carriers are widely used in commercial, industrial and institutional buildings from coast to coast – for installation of all types and makes of wall closet bowls and wall type fixtures. Consult a Zurn representative about wall fixture plumbing.

One of several types of Zurn Engineered Carriers for wall type urinals. With Zurn Carriers, fixtures may be adjusted to any required height from the floor.

Wall type fixture plumbing marks a new era in sanitation. An irrepressible trend cannot for long be denied! When, where and how to install wall type fixtures is thoroughly presented in the new Zurn "Carrier Catalog and Handbook"—virtually a manual for specifying, buying and installing wall type fixture plumbing. Order a copy now! You'll be needing it! No charge to architects and engineers interested in wall type fixture plumbing.

J. A. ZURN MFG. CO. PLUMBING DIVISION **ERIE, PA., U.S.A.**

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ZURN

Pre-eminent Manufacturer of Sanitary Products for the Protection of Human Health and Modern Structures

Handbook and Carrier Catalog No. 50

J. A. ZURN MFG. CO. • Plumbing Division, Erie, Pa., U.S.A.

Please honor my request for the new Zurn Carrier Catalog and Handbook No. 50 for the installation of wall type fixtures.

Name ____________________

Address ____________________

Please attach Coupon to your Business Letterhead. Form No. 50-13

Vickers now offers a very extensive line of oil hydraulic cylinders . . . cylinders that have important improvements. Vickers Cylinders are of modern design . . . as advanced as the Vickers Pumps and Controls with which they will be used to provide better hydraulic systems. There are 12 standard bore sizes ranging from 1" to 8", and 12 standard mountings with innumerable combinations. For complete information, ask for Bulletin 49-55.

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ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

Look how closely this 8-inch steam main is tucked up under the roof. And, at 410 p.s.i. and 550°F., this piping was bound to move up and down enough to need flexible support. Just the hanger to fit this situation was ready and waiting right in the Grinnell Pipe Hanger Catalog 10-D . . . the Pre-Engineered Spring Hanger fig. B268, type G.

Every pipe suspension problem is pre-solved for you by Grinnell ready-to-install hangers and supports. You can get a copy of Catalog 10-D from your Grinnell branch warehouse or local Grinnell jobber.

GRINNELL

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MECHANICAL ENGINEERING

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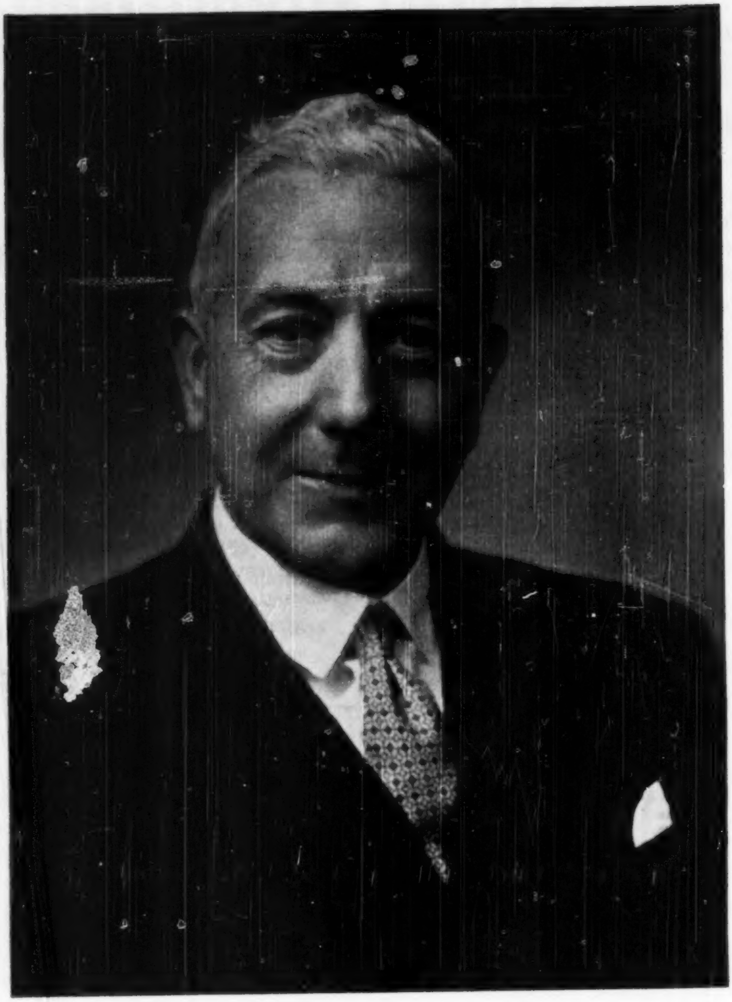

H. J. Gough

(President, 1949, The Institution of Mechanical Engineers, Great Britain, and Speaker at 1949 ASME Annual Dinner, New York, N. Y., Nov. 30, 1949. *See page 3.)*

MAY WE CO-OPERATE

By H. J. GOUGH

PRESIDENT, 1949, THE INSTITUTION OF MECHANICAL ENGINEERS, GREAT BRITAIN

FIRST and foremost, I would express my high appreciation of the invitation of President Todd to attend this Annual Meeting of The American Society of Mechanical Engineers and to have the privilege and honor of addressing this great gathering of brother engineers and their guests. The depth of my personal pleasure is indeed profound, but that is of relatively little significance compared with the compliment extended to the British Institution of Mechanical Engineers, of which it so happens this year that I have the honor to be President. "The ship is more than the crew," and I regard myself as the fortunate representative of our Council and members in being present and conveying our warmest fraternal greetings to this great Society, our best wishes for a happy and successful Annual Meeting, and our certain belief in the future continuance of this Society's great and brilliant achievements for professional engineers and mechanical engineering. That collective message, Mr. President, includes a very great number of personal greetings I bring to yourself and your fellow members.

Now, it is not the custom of an engineer to dwell in the past; his efforts are primarily directed to the improvement of what already exists and, by the use of science, invention, and modern productive methods, to make yet another creative advance. But he is keenly aware of the value and necessity of profiting by the thought, experience, and achievements of his predecessors before attempting a novel adventure although, unlike the historian, he regards this study only as a means to an end. And we, who are privileged to be members of the two greatest chartered societies of mechanical engineers in the world and desirous of playing our small part in guiding their future, do well to reflect from time to time on their rich history; to recall their formation, development, and achievements; to take pride in, and derive inspiration from, the greatness of their traditions and the men who did so much to shape their destinies and establish their present high influence and prestige. In 1930, at your 50th Anniversary, and again in 1947, you reviewed your proud history; similarly, in 1947, at our Centenary Meeting, we reflected on our heritage. We can both take deep pride in what those records reveal. For, although each movement was entirely independent—and certainly in the early years of our joint existence, the direct influence of one body on the other appears to have been extremely small—yet we find an amazingly close parallel in method of formation and development, definition of objects and aims, natural growth by means of the setting up of local branches at home and overseas, development by budding-off into specialized technical divisions and groups, and an increasing awareness and participation in affairs national and international. And we are brought to a humble realization that our founders and predecessors were unconsciously creating and building something which has far transcended their original plans. Their efforts are rewarded not only by your American Society and our British Institution—great as these are and proud as we are of our membership; they were, also, directly responsible for raising mechanical engineering to the dignity of a high profession and, by the achievements of that profession, making tremendous and lasting contributions to the comfort, happiness, and prosperity of mankind throughout the world.

Let us, then, never forget what we owe to those two historic groups of men. To that group of British railway engineers who, in 1846, were watching some locomotive trials on the steep Lickey Incline and, taking shelter from a storm in a platelayers' hut, decided that the time had arrived to form an Institution

> to enable mechanics and engineers engaged in the different Manufactories, Railways and other Establishments in the Kingdom to meet and correspond and, by a mutual exchange of ideas respecting improvements in the various branches of Mechanical Science, to increase their knowledge and give an impulse to Inventions likely to be useful to the world.

Also to that group of American engineers, who in 1880, decided to form a mechanical-engineering society having as its aims

> the collection and diffusion of knowledge, the advantages of personal acquaintances among members, the value of writing and discussing papers and the significance of the endorsement of a high quality of elected membership

And although it was laid down 68 years ago, the wise definition of Professor Thurston, your first President, still rings true:

> He who would accomplish most in the profession of the mechanical engineer, or in the trades, must best combine scientific attainments—and especially experimental knowledge—with mechanical taste and ability and with a good judgment, ripened by large experience. He must be carefully, thoroughly and skillfully taught the principles of his art in the technical school and the practice of his profession in office and workshop.

These were our founders! may we co-operate in ever keeping their memory green.

There is a great temptation to recall some of the major engineering achievements which enrich the Proceedings of the two institutions, but this is not a suitable occasion. But what memories of great contributions to engineering are awakened by a mere mention of the names of our earliest Presidents: Thurston, Leavitt, Sweet, Holloway, Sellers, Babcock, See, Towne, and Smith of the American Society; we also recall with gratitude the name of Holley for the splendid services he rendered, although death robbed him of the Presidency. Similarly, George and Robert Stephenson, Fairbairn, Whitworth, Penn, Kennedy, Armstrong, Napier, Ramsbottom, Siemens, and Bramwell, of the British Institution. May we co-operate in drawing courage and inspiration from their examples.

But let us turn to the present. We find ourselves as chartered professional bodies, with almost identical objects and aims, charged with the advancement of the science and practice of mechanical engineering by the encouragement of invention and research, by the acquisition and interchange of knowledge and information; as qualifying bodies with degrees of membership; with responsibility for standards of professional conduct; each is held in high regard and esteem by our national governments; during each world war, our members made outstanding contributions to their fighting and supply services. Those historic initial meetings of the last century have resulted in present memberships each of the order of 30,000. We each work

Presented at the Annual Dinner and Honors Night, Annual Meeting, New York, N. Y., Nov. 30, 1949, of The American Society of Mechanical Engineers.

closely, and on very happy terms of friendship, with the other engineering societies in our own country and enjoy excellent relations with those abroad. And we of the British Institution are happy to feel that we enjoy particularly close professional and personal relations with your Society; we are indeed willing and anxious to strengthen and extend these ties to the utmost; we believe that, in so doing, we shall make a joint contribution to the advancement of mechanical engineering everywhere. So, in turning to the future, I would like to offer a few remarks and suggestions regarding further co-operation between the Society and the Institution.

RESEARCH

We may each take pride in our contributions to research in mechanical science. Many research projects are suitable for attack by an individual or laboratory; others require more comprehensive approach. Research into the properties of steam is one of the latter type and the past co-operation between our two countries in this field is indeed a striking example of what can be achieved. It commenced in 1920-1921 with the allocation of work, by the ASME, to certain research centers in the U. S. A. A British offer of participation was accepted and Professor Callendar modified his work to cover an unallocated portion of the program. The co-operation of Germany, and, later, of Czechoslovakia, was also obtained. The work was successively reviewed in 1924, 1929, 1930, and 1934, and a further review in Czechoslovakia was planned for 1938 but did not take place, owing to the unsettled conditions prevailing. But the great progress already made, and its effect on the efficiency of steam usage, is known to all those specializing in this subject; it was only made possible by co-operation and collaboration between all concerned. But many feel that the work will not be completed until there is *one* international steam table, not separate tables for Great Britain, U. S. A., Germany, etc. This may be a subject for further co-operation in research.

The subject of heat transmission is one of wide importance and to which American researches have made notable contributions, especially in recent years. Arising from a suggestion of Colonel Davies, arrangements are now being finalised for a joint discussion between our two institutions to be held in September, 1951. The progress made since 1939 in basic research and practical developments will then be thoroughly reviewed and proposals for further co-ordinated research are sure to emerge.

In the field of the failure of engineering components by fatigue, a most important problem has to be solved in regard to the extent of "size effect." The available knowledge, most of which is due to American research, indicates clearly that this effect is present and that the fatigue resistance of components decreases as the dimensions increase. For safe design, it is urgently necessary to ascertain the cause and extent of this curious effect; a series of carefully controlled experiments on large specimens is required. To obtain this knowledge within a reasonable time and covering a wide range of materials, extensive resources of staff and equipment are required and close collaboration and co-operation between a number of laboratories is most desirable. I have raised this matter with the relevant committee of the ASTM, but I feel they will not mind this further reference to the matter as it affords such an excellent example of the value of co-operation in research; also, the subject is of real interest to the Applied Mechanics Division of this Society.

I have mentioned only these three research items; there are many others. I feel that the complexity of modern research, coupled with the need for conservation of research effort and resources, often makes obsolete the old method followed by many independent researchers, whereby they retired for long periods into the cloisters, to emerge and confer only when a report stage was reached. There is so much to be said for preliminary joint planning, frequent discussions, and constructive criticism, between specialists working in the same field, while the researches are in progress. Therefore, where our institutions can usefully assist in research, may we co-operate.

JOINT DISCUSSIONS AND MEETINGS

A most valuable field for co-operation lies in organised discussions on selected subjects of joint interest at which it is desired to focus the state of existing knowledge and practice; we are extremely grateful for the great assistance we have received from this Society on so many occasions. Each institution may assume responsibility for obtaining papers from the specialized authorities in its own country, may send representatives to participate in the discussions, and may assist in the publication or disposal of the proceedings. Among many such occasions, we recall the valued participation of this Society in the General Discussion on Lubrication and Lubricants held in 1937; in the Machinability Conference of 1946; in the series of lectures on the development of the Internal-Combustion Turbine, held in 1946, and, again, in 1948; in our Centenary Celebration Meetings of 1947. An event of special significance was the address, in 1946, by William L. Batt, on the progress of United States work toward the unification of screw-thread practice; the proposals now being adopted for common thread standards in the United States, Canada, and Great Britain may come to be regarded by future generations as a major event in the history of mechanical engineering.

The need for major discussions of this type must be comparatively infrequent but they offer unique opportunities for joint action. When further subjects occur to one of us, we trust the question put to the other will be: May we co-operate?

The foregoing remarks apply primarily to detailed technical discussions but we must certainly not overlook the value of meetings of a more social nature. Summer meetings, in particular, offer most pleasant opportunities for our members and their ladies to get together and enjoy hospitality and pay visits to places of cultural and historic as well as technical interest. In 1900 our Summer Meeting was attended by a number of your members and, in 1904 we enjoyed your generous hospitality in Chicago; in 1910 a joint Summer Meeting was held in England; in 1932 we received a most hearty welcome in Canada and the United States. In 1939 you had kindly made all arrangements for our reception in New York and it was indeed to our great disappointment that the gathering war clouds prevented our visit. We look forward keenly to a further visit of your Society to England; however austere, by American standards, may be the fare we have to offer, never has such a welcome greeted you as that we shall extend.

And so, may we co-operate in further summer meetings?

WATT MEDAL

I should like to make a passing reference to the valued co-operation of your Society in regard to the James Watt International Medal. Instituted in 1936 on the bicentenary of Watt's death, this gold medal is awarded every two years to an engineer, of any nationality, who is deemed worthy of the highest award our Institution can bestow and that a mechanical engineer can receive. In making the award, we have the co-operation of fifteen major engineering institutions and societies throughout the world; your Society, of course, makes the nomination from this country. Especial eminence and achievement in any of the four aspects of mechanical engineering —research, education, invention, or production—constitute eligibility. Of the seven awards made to date, two have gone to very distinguished Americans: In 1939 to Mr. Henry Ford;

in 1947, to a Fellow of your Society whom the world rightly regards as having made outstanding contributions in the field of applied mechanics, and also to engineering education and research; I refer to Professor Timoshenko.

SPECIAL LECTURES

In your Society and our own, progress in the science and practice of mechanical engineering is normally brought to the attention of our members by papers read and discussed at our meetings and recorded in our Proceedings. In addition, certain of our members have, from time to time, made generous endowments to provide for annual or periodic reviews, by authoritative authors, on certain specified branches of mechanical engineering. There is still a gap to be filled; the occasional delivery of a lecture of a more general, often of a philosophic, nature covering a wide field of thought and ripe experience; your Journal contains some brilliant expositions of this kind. Our capacity to arrange for such lectures for the instruction and enjoyment of members has been greatly increased by the magnificent bequest of a sum of about £130,000 under the will of our late member, Mr. James Clayton, a pioneer of the rayon industry. Of the income from this bequest, the Institution is able to use a portion to provide "Clayton Lectures" by engineers or scientists of outstanding eminence from home or abroad by the payment of appropriate fees and expenses. Among the Clayton Lecturers we have been fortunate enough to receive are Dr. Nadai, Professor Timoshenko, and Dr. E. G. Bailey, each of whom delighted our members and enriched our Proceedings. Visits and lectures of this kind have much more than technical value; they afford yet another means of extending cordial relationships and furthering understanding. We hope that your Society will not hesitate to help us by making further suitable nominations from your membership; such will be most cordially welcomed as another form of prized co-operation.

INTERNATIONAL CONFERENCE OF ENGINEERING SOCIETIES

In concluding, may I pass from matters which solely affect our two societies to the field of international co-operation among engineering societies in which we are both actively participating, and, in particular, to the Conference of Representatives from the Engineering Societies of the United States of America, Western Europe, and Great Britain, held in London in September. In addition to the three major engineering societies of the United States and Great Britain, Belgium, Denmark, France, Holland, Norway, Sweden, and Switzerland were represented. This was a resumption of the adjourned Conference held in October, 1948. The formal aims and objects of the Conference are, no doubt, well known to all members of the ASME but I feel it is the desire to establish direct relationships, on a basis of mutual understanding, between the participating societies that makes this collaboration so worth while. Each participating society is now fully aware of each other's standards of education, grades of membership, methods of working, scope of activity, and so on. Means of mutual assistance and collaboration by exchange of publications, and lecturers, by facilitation of visits of members, have been offered and discussed. Certain difficulties, which at first appeared insoluble, yielded to frank discussion, and complete agreement was finally reached on recommendations to be made to the responsible Councils (for the Conference was purely consultative, having no executive powers). If those recommendations are accepted and put into effect, I firmly believe an important step will have been made toward obtaining for our brother engineers in these other countries the same high status and prestige which we ourselves enjoy. The next Conference will be held in Holland in 1951. May we again co-operate by each sending an authoritative representation. For we have a joint responsibility, not only for the advancement of the engineering profession in the United States and Great Britain, but for any similar influence we can bring to bear in other industrial countries throughout the world.

Close fraternal bonds have long existed between ourselves and the engineering societies of Canada, Australia, New Zealand, South Africa, and India. There is also the Pan-American Union of Engineering Societies with which your Society is associated. Such international co-operation and understanding among engineers must be for the good of our profession; we may, perhaps, hope that this brotherhood among engineers will also assist toward the achievement of that universal sense of brotherhood among mankind on which the lasting peace of the world so fundamentally depends. May we co-operate fully in the attainment of these worthy ideals.

WE *Must* CO-OPERATE

By JAMES M. TODD

PRESIDENT, 1949, THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

DR. GOUGH, distinguished guests, members of The American Society of Mechanical Engineers, ladies and gentlemen:

This is indeed a unique occasion. Never before in the 70 Annual Meetings of this Society has a president-in-office of our counterpart in Great Britain—The Institution of Mechanical Engineers—spoken to us at our Annual Banquet. Never before have the fraternal greetings of that Institution been conveyed to us on such high authority as Dr. Gough holds. Never before in peacetime have conditions been as favorable as they are today for the fruitful co-operation between our two organizations of mechanical engineers. Never before have men of good-will desired more sincerely than they do today that peaceful world in which engineering may be given an opportunity to shower its benefits and blessings—not its instruments of destruction—upon mankind. In this hour we are of one accord, as we are of one language and of one industrial and engineering heritage.

When you return to your countrymen, to your Council, to your Institution, sir, it is my hope that you will convey to them our warmest felicitations and our assurance that the theme of this meeting, "Engineering in a Peaceful World," which you so earnestly wish to see advanced, if I correctly interpret the message you have just so eloquently delivered to us, is no idle combination of words with us; that your too brief stay in our country will have convinced you that not only our engineers, but a majority of our citizens also, have faith in the effective influences of engineering in creating a peaceful world; and, furthermore, I hope you will have learned that we, who have been spared

Presidential address delivered at the Annual Dinner and Honors Night of the Annual Meeting, New York, N. Y., Nov. 30, 1949, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

the worst ravages of war, are motivated, in our desire for co-operation and to extend aid, not only by self-interest and humanitarianism, but also by a sense of gratitude to Britain and Western Europe for the fine traditions of culture, science, engineering, and human rights of which we are the world's most fortunate, and, I sincerely trust, the most grateful, heirs.

By the inflection of your voice, sir, you have impressed on this audience what is made apparent by punctuation in the typed copy of your address, which I have been privileged to read. You have used the words "may we co-operate" both as a question and as the expression of a fervent desire. By the examples you have cited you have shown how we have co-operated in the past, and how we may further co-operate in the near future. The *question* you have put to us you have answered, on behalf of your Council, in the affirmative. Our reply is the same. The *desire* for co-operation is shared by us also, and your persuasiveness has emboldened me to restate it as a positive conviction, which I am sure my own Council and my own countrymen also hold, in the words, We *must* co-operate!

And now, sir, if I may charge you to carry that statement of our conviction to your Council and to your countrymen, I shall, for the next few minutes, speak on the same theme to our members and guests, in terms which I am confident they will understand and in which, I hope, you will find a slightly greater degree of humility than you are accustomed to note in American speeches. The truth of the matter is, if I may state it frankly, that we have a tremendous faith in, and enthusiasm for, what we call "the American way" and a sincere, if sometimes impatient and irritating, desire to share it—our critics say force it down their throats—with the rest of the civilized world. But even this American way had its roots in British and European soil, and was developed by our ancestors who were inspired by the great Old-World apostles of the essential personal, economic, social, political, and religious freedoms, and who came to this country to put these freedoms into practice.

The theme of this 1949 Annual Meeting—the 70th such meeting of our Society—"Engineering in a Peaceful World," suggests that we dedicate ourselves to the task of seeing to it that the contributions of mechanical engineers to technological progress shall be used to further the advancement of a peaceful world.

We have lived under an economic system in which the profit motive has been a controlling factor. The term has fallen into disrepute in the minds of some persons who associate it with merciless, inhumane, cutthroat competition—money grabbers at home and dollar diplomatists abroad. Yet it is apparent that our material progress has been based on profit—a special profit to the initiators of each step of material progress and a general profit to the mass who enjoy the fruits of that material progress—and that accumulations of that profit have made further progress possible. I have therefore chosen to modify the expression, and the concept somewhat, by calling it "profit progress," the essence of which I hope to make clear to you. By means of profit progress we must not only continue on our "American Way" for the advancement of engineering as an international influence for peace; we must also extend our knowledge of the techniques of profit progress to nations which hope, by means of industry, to raise the material standards of living of their peoples.

Reported atomic developments in USSR make it even more imperative that engineering be utilized in future for peaceful progress and not for destruction. As the Soviet *Red Star* so aptly put it, "there are just as many kilometers from Philadelphia to Moscow as from Moscow to Philadelphia." If another conflict should develop, we may no longer be able to save our own land from devastation. That must not happen here, nor in any other part of the world. It may not happen if the needs of nations can be met by peaceful means.

In lieu of a military line of defense and by the use of our most recent developments in engineering, we must encourage thinking in terms of what these developments might mean to a peace economy, if the same facilities were to be utilized to give the world the benefits of engineering for peacetime progress.

History is filled with the failures of nations to keep the peace by means of force. Why, then, should we again plan a peace-time program built primarily on military might?

General George C. Marshall recently said in my home city, "The United Nations Organization is the world's safety valve." If through the United Nations Organization mechanical-engineering progress can be made an international influence for peace, our work will have been beneficial and successful. And one way for engineers to carry out the high purposes of the United Nations Organization is for them to begin with their own groups at the international level.

We must succeed in giving the rest of the world the necessary inspiration to struggle toward a higher plane of living conditions so that they may find within their own physical and mental resources the means to meet their needs. Engineers are particularly competent to aid in this area.

We must show the subject races of the world, through our engineering contributions, hope of a peaceful world and a broader knowledge and understanding of the ways in which the engineers of the western world have aided civilization's material progress.

If through this "world's safety valve" we can learn how to "blow" the damaging accumulations of pressure without armed conflict, then the effort, the sacrifices, toward that accomplishment will not have been in vain.

In this country forces are at work which are rapidly moving us along the path of restricted freedoms. Strong pressure is being exerted to create a dictatorship just as effective and potentially as destructive as any dictatorship in history. Large segments of our citizenry are being convinced, through ignorance and misunderstanding, often deliberately created, that the most effective way they can better themselves is by establishing some form of collectivist state in which average performance and reward are to be forced on everyone. We are convinced that engineering progress toward a peaceful world can best be developed in an atmosphere of freedom.

Our engineering accomplishments in the past were made within a system of free enterprise, a system under which this nation attained the high position it now holds by the unfettered effort of the individual citizen—by profit progress, as I have called it—toward a preconceived economic goal, not by industrial conscription in times of peace.

We must see clearly that we cannot make unsuccessful people prosperous merely by legislative acts or merely by legislative selection. Engineering progress toward a peaceful world will not come by government decree.

Would government edict alone have made a Virginia farm boy—Cyrus Hall McCormick—the influence in world agriculture that he became?

Can you imagine a government selecting an unschooled ex-newsboy and telegraph operator—Thomas A. Edison—to influence our daily lives by inventing the electric light?

Would a government board have chosen a 40-year-old mechanic—Henry Ford—to put America on wheels?

These are but three illustrations of engineering and industrial developments under a free-enterprise economy. They help to emphasize the possibilities of unfettered engineering contributions to a continued peacetime economy. Even our wartime advance under government control was based on researches that

were conducted in an era of free enterprise and under the impetus of influences rooted in that system. Engineering must remain forever free.

When Pope Pius XII, after meeting with a group of United States Senators, made the observation that "recent great strides of industry are drawing together the remotest regions of the world," I am convinced he had in mind engineering's contribution to a peaceful world, and, I like to think, through what I am calling profit progress. When peoples are drawn closer together by whatever bonds, they learn to understand one another better and how to live in better harmony with one another. Dr. Gough has given us testimony on this score tonight in his reference to the recent London conferences of engineering societies.

Engineering progress has always been based on ingenuity, and engineering ingenuity exists in many forms. The adaptation of old ideas to new developments, the utilization, for new purposes, of old and familiar equipment, the practical application of new scientific discoveries to the needs of mankind—all these illustrate what I have called profit progress, because in all of them the accumulations of the profits of a free-enterprise system are called upon to make still further advances of progress and thus enhance engineering contributions to a peaceful world.

This to me is the role of the engineers in a peaceful world. So long as engineers continue to display marked ability to find unique solutions to new problems, so long as their application of profit progress is not impeded by governmental restrictions, the parade of technical developments with their contributions to world peace will not fail in its forward movement toward a better economy and a growing co-operation with other freedom-loving peoples.

So this, Dr Gough, is my affirmative answer to your question, may we co-operate? And my response to your fervent *wish* that we may co-operate is my deep and sincere conviction that we *must* co-operate.

James M. Todd

Retiring President of The American Society of Mechanical Engineers for 1949

THE ATTITUDE *of* MANAGEMENT *Toward* INDUSTRIAL RESEARCH

By ROBERT E. WILSON

CHAIRMAN OF THE BOARD, STANDARD OIL COMPANY (INDIANA), CHICAGO, ILL.

INTRODUCTION

IT IS difficult, even for the best informed among us, to realize the uniqueness of the times in which we live. As an aid to visualizing the true situation, suppose we compress the 500,000 years in which man has been developing, into 50 years, comparable to our own lifetimes. On this scale it took man 49 years to get over being a nomad and to settle down to living in organized communities. It took him even longer to get his first pair of pants, and many of the other things which we consider timeworn characteristics of man. About 6 months ago a few men first learned to write in crude fashion, but on this scale it was only 2 weeks ago that the first printing press was built! At the present rate of increase I sometimes think that in another 2 weeks we shall all be buried under printed matter.

And within the last day have come such amazing things as radio, television, Diesel locomotives, rayon, nylon, sulpha drugs, penicillin, bookkeeping machines, electric computers of inconceivably complex equations, 100-octane gasoline, color and sound in motion pictures, and hundreds of other things we take for granted. On this time scale the release of atomic energy, jet planes, and streptomycin and aureomycin came into existence only a few moments ago.

What is the cause of this tremendous acceleration in the making of new products and devices and important new scientific discoveries? What has happened in this last day, or 30 years on the true time scale? To my mind the essential factor is applied research carried out on a large scale mainly by industry. True, there were a few pioneers in this field before 1919. General Electric, du Pont, Eastman, and a few others had already organized outstanding laboratories which were largely responsible for making their companies so prominent in their fields. But most industrial progress up to that time came as the result of individual inventors, frequently men mainly engaged in other lines of work. The telephone, for example, was developed by a teacher of the deaf, the telegraph by another professor, and radio as well. Edison and Steinmetz were regarded as freak geniuses, of which we could expect to have only one or two in a generation. However, the great success of the afore-mentioned pioneer industrial research laboratories, and the success of the Chemical Warfare Service in solving so many problems so quickly during World War I by well-organized research, awoke industry to the fact that it was possible to hire people to invent, and to make money by doing so.

In any case the expansion in the number of men engaged in applied or industrial research since the end of World War I is a matter of forty or fiftyfold. Applied research is in many ways the most remarkable development of our generation, which is having and will have profound and unforeseeable effects upon our life and times, and on our future. It seems inconceivable that this rate of acceleration can continue—"Trees do not grow unto Heaven." Another fiftyfold expansion in the next thirty years would hardly leave enough people to do the production and service jobs of the world! The law of diminishing returns may also begin to operate, as I shall later point out.

PETROLEUM-INDUSTRY ATTITUDE

In the petroleum industry, and in most industries today, there is no question in management's mind as to the value of and the necessity for research. We have seen many examples of what research can do. Indeed, the present-day petroleum industry is largely a demonstration of what research has done to improve products, increase yields, cut costs, and increase the scale of operations. If we tried to evaluate what research has done for our industry, it would run into the billions of dollars; and at the same time research has done even more for the consumers of petroleum products.

We have also seen what happens to companies which do not carry on research. They gradually drop out of existence because they cannot keep up with their competitors' better products and lower prices—and this competitive process is the basic cause of the growth and vigor of American industry.

RESEARCH GROWING MORE DIFFICULT

Present-day management also has no doubt as to the need for expanded research facilities. We must have more and better organized expeditions into the unknown if we are to bring back results. The change that has taken place during the past 25 years of research is a good deal like that which has taken place in geographical exploration during the past 200 years. The time has long passed when a Daniel Boone, with a rifle and a pack horse, could add greatly to our store of geographical knowledge. To make significant additions today requires a well-organized Byrd expedition, going to extremely remote places with a plenitude of scientific equipment and observers. In the past 25 years many lines of research have reached about the same point. The processes in our plants today have been worked over by dozens of good chemists, physicists, and engineers to see what could be done to reduce costs. The efficient but costly equipment they have designed for us has increased our investment so much that it is difficult to find a new process enough better than the old one to justify scrapping the present equipment. Our fixed charges are a far larger part of total costs than they once were, and operating charges are a smaller part.

This increases the difficulties of showing results from research and indicates the need for more research on reducing investment costs—research men are too often inclined to be perfectionists in the design of large-scale equipment. On the other hand, in one respect the analogy between geographical and scientific frontiers is not a good one, because we have few geographical frontiers left today, whereas the frontiers of science are ever-expanding into the unknown. We recognize, therefore, that we must expand our research if progress is to continue at anything like recent rates. There is, however, some question in management's mind as to whether the law of diminishing returns may not be starting to take hold. Research costs cannot continue to go up forever as they have in the past

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The costs have been justified to date—more than justified. But sometime we are going to reach a place where we cannot afford to go further in expanding our research organizations, because the rest of the operations will not be able to carry the load. Someday there will not be enough yield for each dollar expended in research. Today we are approaching the point where we may save three workers here and a few dollars there, but we have to add a chemist in operations and a chemist in the laboratory to keep up with things, and the resulting economy is not very great! So, research must realize that it faces a harder and harder job to justify its costs.

In some cases research laboratories seem to make a fetish of having the latest and fanciest equipment. When a new electron microscope comes out, no matter how much it costs and no matter how little use there is for it in a given laboratory, every laboratory seems to think it must have one. Before major investments are made in apparatus, we should be quite sure they are really going to fit into an intelligent research program directed to the company interests.

Research has long done a fine job in studying the costs of operations of all sorts, but the time has come when it must give some attention to cutting its own costs. Physician, heal thyself! Research today is big business and expensive business. Our own company is spending about $9,000,000 annually on research and development work.

Most of my thoughts on the question of the attitude of management toward research may be covered under two general heads: (1) What has management the right to expect of a research director, and (2) what does a research organization have the right to expect of management? Having been on both sides I hope my experience may be helpful.

WHAT IS EXPECTED OF A RESEARCH DIRECTOR?

The first requirement is unquestionably that he be a good administrator. That does not necessarily mean that he must be a brilliant scientist. While there is not any necessary exclusion between the two, certainly not many of our most brilliant scientists are good administrators and not many of our best administrators could be classed as brilliant scientists.

We do, however, expect the research director to make contributions to the work. He should be a man who has come up through the ranks and who knows how research is done, what it takes to make a good research man, and he must appreciate the brilliant scientist. That brings up the problem of how to use the man who is a very able scientist, but who is either not a good administrator or is not interested in administrative work. It is important to have an organizational pattern and salary scale that are flexible enough to provide such a man with an adequate reward in salary, even if he feels he works best by himself or with only one or two extra pairs of hands.

I remember very well my first industrial research experience. I was amazed to find that a man of Dr. Langmuir's outstanding ability did most of his work with one assistant, in a single laboratory. He was, of course, available and widely used for consultation, but his outstanding contributions were made by carrying out his experiments with his own hands. It is well known how much he contributed, and what a great asset he has been to the General Electric Company.

It is necessary to have what might be called both a staff and a line organization in research. Some men, as they grow older in experience and possibly a little less inventive, are most useful in consulting staff positions, as associate directors, or something of that kind. Other associate directors furnish the drive, and the day-to-day direction of most of the research is put under them.

The second requirement of a good research director is that he be fast on his feet. He must be a man who realizes that we are in a competitive struggle and that it is up to him to keep us ahead of the other fellow. He should see new trends sooner than management can. His job is to be on the watch, to cull the literature, to be on his toes in every respect. Being fast on his feet also means that he must cut off lines of work that have ceased to be promising. There is nothing worse than a research director who starts a man to work on a certain problem, and then lets him go on and on without a frequent re-evaluation of the promise of his work. One way we avoid that is to have a few more problems than men. It is an effective way to keep man power from being wasted.

The appraisal ratio, applied to a given research project, is the product of the probable value to the company of a successful result, multiplied by the probable chance of success, and divided by the estimated cost of the research and development—not merely the research cost. All these factors involve estimates, but a good research director is in the best position to make these estimates.

Obviously the ratio must be substantially greater than unity or the problem should not be tackled. Some problems will arise that are of such tremendous potential value to the company that they should be studied even though the chances of success are relatively small. Conversely, there will be many problems that are not of tremendous value, but that are justified because the chance of success is large and the probable cost is small.

Just what the ratio should be for a problem to be undertaken is hard to say. A good deal depends, of course, upon the optimism of the man who makes up the figures and upon the comparison with the possible other projects. If all of the problems in the laboratory are rated, it will be surprising how widely the ratios differ—indicating that in many cases too much effort is being put on certain lines of work and not enough effort on other lines.

The third requirement of a research director is that he keep the company business and potentialities in the forefront of his thinking at all times. Too many research directors have private hobbies. They may have a reputation to maintain in a certain field, and they want to continue to publish papers in it. Such considerations must not enter into the direction of research. We cannot, in industrial research, afford a lot of hobby riding.

Another and possibly the most important function of a research director is to form a courageous two-way channel between management and the laboratory. I say "courageous" because it takes guts to go up and tell the management when it is making a mistake; and yet management appreciates a man who will do that and keep hammering away until he has them convinced, or else has decided there is no hope. But I do not think it happens very often that the director and the management cannot see eye to eye when they make a real effort to understand one another's viewpoint. Overcoming initial objections often takes courage, however, and many research directors seem to be deficient in that. They growl and complain that management has not done this or that, but they really have not exerted themselves adequately to get their points across.

Equally important—and I think possibly more research directors fail in this respect—they should take back the viewpoint of management and try to sell it to the men in the laboratory. We do not have the time to tell all the employees our problems, to explain why we cannot do certain things, or why we must put more emphasis on certain problems and less on others. We can and should tell the research director, and try to satisfy him. The research director should not go back and say, "The brass hats insist on so and so," without explaining the reasons. He is the man who must carry the explanation

down to the fellows working on the problem. A research worker can hardly be enthusiastic if he is working on something the importance or value of which he does not understand.

Finally, the research director should be conscious of the personnel problems of the large modern laboratories. When I first went into an industrial laboratory, where there was a small group, the entire staff talked over all the problems in the laboratory at a single conference at least once a week. I realize now what a fine broad opportunity that was to get an understanding of the company business, in comparison with the restricted view most research men can get in our large present-day laboratories. Ways must be found to broaden that view for promising young men.

Professors tell me that students, coming back after a year or two in large industrial laboratories, are generally rather discouraged. They do not know why they are working on things, and they feel they are making slow progress. They know only one little corner of the company's business. In addition, they have gone from a beautiful campus to an industrial community with unsatisfactory housing conditions, and they are naturally somewhat disillusioned.

I sometimes think it is best never to hire a man straight out of school but to let him go to another company for a year or so, where he can learn that working for a living is not the joyful thing his professors may have painted it, and realize that no working conditions are entirely satisfactory. By the time he gets to his second or third job, he appreciates some of these facts, but he seldom does on his first.

The research director, however, can do a great deal to ease that situation. The new man comes in as a stranger in a big organization. He needs personal friends and social contacts. Every supervisor who has a group of men working for him should assume the responsibility for getting the new man properly introduced, making some social contacts, having some activities—bowling teams, or baseball teams, or science clubs—so that the new man can feel he has a chance to make friends. It is also important to avoid giving him the feeling of being regimented.

OBLIGATIONS OF MANAGEMENT TO RESEARCH

So much for what we expect from our research directors. Now for the obligations of management to research.

In the first place it is our number-one job to furnish good research direction. Management does not find that easy; it is a difficult job. It is highly desirable of course to develop a good research director within your own organization. If that can be done, it is easier for the man to sell himself. He has been sized up and appraised, and if he has risen to the top in a competitive struggle he is pretty sure to be good. Sometimes, however, it is not feasible to select a director from within the organization. In picking an outsider, great care must be exercised.

I am reminded of one of my first consulting jobs with a company in New York, when I was working in the research laboratory at the Massachusetts Institute of Technology. I found this company was making a product that involved a lot of technical problems. I said, "How can you people possibly get along without a chemist?"

They said, "Well, we have had very unsatisfactory experience with chemists."

"How many have you had?"

"We have had three, and none of them worked out well."

"Well," I said, "that is certainly a surprise to me. I do not see how you can get along without one. How did you select these chemists?"

"Oh," they said, "we advertised in the *New York Times*."

Next, the research men are entitled to adequate compensation. During the war we were hampered in bringing up research salaries to proper levels, because they were under government control. The wage earners, represented by unions, could get approval for almost anything; but it was very difficult to get approval for adequate salary changes. However, that situation has been largely remedied. Salaries have been going up rapidly, and I do not think most managements begrudge this when they understand the problem.

Further, the research men are entitled to adequate facilities and good working conditions. That does not mean that they should be set off in a park with a country club around them. I believe a laboratory should be close to the plant, partly for the effect of plant contacts on the laboratory men, and partly for the effect of laboratory contacts on the plant men. It is a great mistake, in my opinion, to isolate most of the research work from the plant, although there may be a small separate research laboratory for fundamental problems.

Management should be expected to supply "patient" money, as John Teeple picturesquely described it. Management must not be too impatient for quick returns. Beware of the company that has just recently "got religion," or that has some new vice-president who is anxious to make a record and thinks research will give a quick answer to all the problems. I have seen a half-dozen cases where a big research organization was built up, with more men than problems, and miracles were expected within the first 2 or 3 years—and then the whole organization broke up. A steady, slow growth is needed to insure a stable organization.

It is much like starting out today to do wildcatting in petroleum. For 2, 4, or 5 years, a company would have a hard time getting into the black, because it would not have any backlog of discoveries made 5 and 10 years ago to help carry expenses. It is the same way with research. Usually the results of research do not make themselves felt in the first 2 or 3 years. But that background of research may crop out and be of tremendous value several years later.

The research director should also be given a reasonably free hand. My own philosophy of handling research has been to give a good research director a stack of chips and tell him to get into the game and do his best. It is a gambling proposition. I do not think management can contribute a great deal to telling him which hand to back, though it should keep him advised of the facts he needs regarding the economics of the situation, and the plans of the company.

I do not favor the budgeting of individual projects—that is, saying at the beginning of the year, "We are going to spend so much on such and such a problem and no more." For one thing, it keeps a research director from being fast on his feet. It keeps him from shifting men from one problem to another. Also, it is almost bound to cut down the amount of fundamental work he does. A good research director can be counted on to keep a balance of fundamental work going on if he does not have to budget his problems, because he knows that without fundamental work the laboratory results will tend to peter out. He is much more likely to keep a proper balance if he does not have to account on each problem. In addition—and most important—it is an awful accounting headache all the way along the line. Why spend so much money to find out exactly what this, that, and the other problem costs when you cannot accurately appraise its value in any case?

More time and effort is wasted on trying to keep accurate account by problems in a research laboratory than almost any other field.

Management should build up the organization in such a way that research workers are relieved in so far as possible of routine work. It is a disgrace that some laboratories do not have enough dishwashers and errand boys, and use research men for

such work. It is a waste of technical man power. Fortunately, with research workers so scarce, this viewpoint is becoming more and more appreciated.

Relieving research workers of routine applies also to patent applications. Most research workers are, understandably, not particularly interested in the patent aspects of their work. Patents are not the most important thing; but if a company is engaged in industrial research, it must build up a reasonable patent picture to protect its own operations, aside from any possible royalties. There should be a separate well-staffed organization to do all the searching, to do practically everything except write the original notes of what is discovered.

Management should be ready to give prompt and courageous attention to worth-while ideas. There is nothing so devastating in a research organization as to develop a process or product and have it turned down or given the glassy stare—or to have it lie in a report without notice for 4 or 5 years—until some competitor comes out and makes a great splurge with the same idea. Often management, if it does not have a good memory, will call up and say, "Why in blazes didn't you boys get that idea?" Of course, in such cases, that is just what every research director hopes management will do.

Management should be more willing to back the horses developed by its own laboratory rather than something developed outside. Too many managements are carried away with the glamour of things that some outsider describes in glowing terms, while they hesitate to support the developments of their own laboratories which are presented with a more honest appraisal of pros and cons. Sometimes the real blame for this situation lies on the research directors, who have not done as effective a job of selling as they might; but that is not the only reason. Sometimes there is the attitude that, "Well, I knew John when he was just a lab boy, and I don't believe that can be such a wonderful idea." But if somebody across the street brings it out, then they are all hot and bothered about it immediately.

We have all found that even the best research organizations will make occasional mistakes and will bring in some sour ideas; but if real money is put into a process or equipment, although it may not work in just the way it was supposed to, every research man is on his toes to see that an adequate return is obtained, and it usually is.

Having research men know that management is ready to back their good propositions promptly puts them on their mettle. It increases their enthusiasm, and it makes them a little more careful about the things they propose if they realize their proposals will be taken at full face value.

There is a responsibility on the part of management not to divert too many men from research to sales technical service, and manufacturing technical service. Research directors should not resent the requests that come in, as some directors seem to do. Such requests show that the company is becoming conscious of what technical men can contribute. But when a man who is doing a good job of manufacturing or selling gets interested in what the laboratory can do and sees some examples, he is likely to become more and more demanding. There has to be a limit somewhere. We have generally found it desirable to set up a special staff of men for technical-service work. The man who directs such work is free to say whether these men shall work on this, that, or the other problem; but he is not free to take other men away from fundamental research.

For this reason I consider it undesirable to have a research department report to the vice-president in charge of either manufacturing or sales. It usually turns out, in the course of time, that if this vice-president is doing the job as he should from his particular viewpoint, most of the men are likely to be diverted to sales technical service or to manufacturing technical service, as the case may be. Or perhaps the vice-president is trying to double as a director of research, which he should not do. He has other responsibilities.

It is the obligation of management to have an ever-open ear. This does not mean it has to be open all afternoon to the research director; but, if he is ready to make a concise and factual presentation, management owes it to him to see him and to give him the time he really needs. I think management is coming more and more to that viewpoint. Sometimes a research director may think he is unfortunate in working for a man who is very busy, but he may find that after all he is better off if the boss does not have time to try to run his job.

Management should always make it a point to attend important research conferences, or have some representative there and give a brief talk, so that the younger men will know that management is interested in research. Also, when an important new development comes up for decision, the research directors should bring up the men who worked on the problem and give them a chance to present their case, or at least be present when it is talked over.

PARTICIPATION IN TECHNICAL-SOCIETY ACTIVITIES

Management owes the research worker, even those down the line, a reasonable opportunity for technical contacts. Of course, there has to be some limit. A company cannot send half its research staff to a chemical-society meeting, but when the meeting is in the neighborhood and there is not much expense involved, a fairly large number of the men can be released for a day or two—reducing the number progressively, of course, as the meetings get farther and farther away from home. However, I am always suspicious of the research workers who do not bother to attend local-section meetings and then have a great urge to attend a national convention a long way off.

I do not think it is wise to allow research to be done for the purpose of presenting papers. That can become a never-ending proposition, with people more interested in getting a national reputation on some particular subject than in doing something useful. When a man has done a job for a company, however, and wants to present it to a technical society, he should be allowed to do so—after adequate patent protection has been obtained. Research men should have that right and should be encouraged to use it, even though it may take a certain amount of company time to write up the results in suitable form for a paper. Such presentations do have substantial indirect value to a company, which gets a reputation for being willing to have its men present papers and for being progressive.

The men in the research organization, when they are interested and willing to do it, should be given a reasonable amount of time to take an active part in either local or national professional-society activities. I know this participation helps to keep professional men more contented, and it also helps to make the societies better informed and provided with abler officers and directors.

Finally, management owes it to research not to swing back and forth from one extreme to the other, depending upon how the stock market behaved in the previous few months. We all have seen instances in which companies have built up big laboratories in boom times, and then in poorer times have liquidated them. This does not mean that the research laboratory can expect to be exempt from everything that happens in times of curtailment, but we should look at research as a long-pull proposition. Frequently research is more needed in depression than in boom times.

While management and research directors are bound to view some things differently, a sincere effort on the part of each to understand the other's viewpoint will help them both and greatly benefit the whole enterprise.

The IMPLICATION *of* FEDERAL SUPPORT *of* EDUCATION *and* RESEARCH

By R. B. STEWART

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ALTHOUGH education has been assumed to be the responsibility of local governments because the Federal Government was not specifically charged with it by the Federal Constitution, nevertheless, the use of Federal funds in aid of education and for research is not new. In fact, the Federal Government has been in the business of providing some of the money for education and research for many decades. The largest sums have been provided, however, for specific educational projects and programs in both the public schools and the colleges and universities. Nor have all of the items of assistance through Federal funds been in the public-controlled-and-operated educational agencies. I am informed of one occasion when Federal funds assisted and perhaps sustained the Johns Hopkins University at the Civil War period. During the last war, of course, the Armed Forces used large sums for specific programs indiscriminately in private and public colleges and universities.

When one reviews the history of the land-grant colleges which owe their original charter to the Morrill and subsequent acts of the federal congress, and when one considers the large amount of federal money expended in so-called vocational training, it is perhaps proper to wonder why the matter of federal appropriations for the equalization of public-school education and also in aid of colleges and universities via direct grants-in-aid for building, research, or scholarships, should occasion so much present discussion and debate. I have been directly concerned with the preparation of rules and regulations involving the expenditure of hundreds upon hundreds of millions of federal dollars in education during the past few years. Perhaps it is because of this experience, with the schools on the one hand and governmental agencies on the other, that I am one of those who voice a word of caution in regard to any hasty acceptance of increased use of federal funds for our educational enterprise. In expressing these judgments today, I hope that, while I urge caution and perhaps many reservations about the programs being directed for federal support, I am not necessarily accused of being entirely anti-federal participation in financing education. There seems to be definite need for some federal participation in solving the problem. I am, however, greatly concerned over the manner in which federal funds are to be made available and the expenditure is to be supervised by the Federal Government, for supervised by and for the federal Government should such funds be. I am one of the individuals in this nation who believes that there is danger in the sheer administration of the use of federal funds in direct aid, particularly to higher education, and more especially if use is particularized to individuals or institutions.

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FEDERAL FUNDS FOR PUBLIC AND PRIVATE SCHOOLS

At the present time there is pending in the Congress a definitive legislative proposal to appropriate $300,000,000 annually, in accordance with a rare complicated formula, to the several states for use by the states in support of elementary and secondary education in the so-called public schools of the state. Even though this bill is intended only to provide more funds in any given state in order that the state itself may operate more effective elementary and secondary schools, we are all too well aware of the serious conflicts which have already arisen over the bill—over which schools shall receive what! These conflicts have nothing to do with education, but rather with the control or division of education as between the public, which is spending its money, and religious denominations which also offer educational opportunity to the children of our land.

The big question of Federal funds at this level, therefore, is whether their use will not cause *all* educational institutions—so-called private *and* public—to look more and more to the Federal Government for support. Whether or not federal funds become available for the so-called private or denominational elementary and secondary schools, the fact remains that such schools must conform to the standards established by the State and in one sense, therefore, must compete and compare favorably with the facilities and teaching of the public elementary and secondary school. It is generally true that the further from the base of operations these funds are provided, the less concerned the appropriating agencies become regarding any issues of individual concern to the local unit or the individual citizens themselves. In fact, I believe, because it is generally much easier to convince strangers of our virtues than it is those who know us best, we seek funds from a far-off agency rather than from our local supporters.

It is a fact that, regardless of which public agency provides the money, the funds are coming from the pockets of the taxpayer. We must recognize, too, that the further removed is the expenditure from the control of the taxpayer himself, the more costly it will be to administer the use of the taxpayer's money. Unless, therefore, we wish to avert the gradual loss of local support and later of control over our schools, the more important it is that communities stop wailing about the difficulty of supporting education on the local basis and get busy fulfilling their long-established responsibility to provide adequate education for the youth of our population. I repeat that any large-scale federal subsidy of local operations, educational or otherwise, will inevitably in the long run require either a substantial degree of federal control or else unnecessary and costly extravagance in order to assure the wise use of funds and equitable allotment among the different agencies which seek to benefit in the use of federal patronage.

USE OF FEDERAL FUNDS FOR HIGHER EDUCATION AND RESEARCH

For the purposes of this meeting today, however, you may be more interested in the specific implications of the use of Federal funds for higher education and research, since all of you are concerned with education at the higher level.

From sources which I believe to be reliable, I understand that it is the intent of the present Administration not to ask the Congress for appropriations to benefit higher education until action has been completed upon the afore-mentioned bill appropriating $300,000,000 to the several states for the further support and avowed purpose of equalizing education opportunity at the elementary and secondary level. Just as soon as that bill is acted upon, however, it is my understanding that a proposal for Congressional action will be made in accordance with the recommendations of the President's Commission on Higher Education to establish a system of federal scholarships for the intellectually qualified, superior high-school graduates in order that no youngster of superior mental ability will be denied the opportunity of receiving instruction at the higher levels. A suggested bill is being circulated at the present time, in a purely tentative and informal manner, in an effort to bring about the formulation of an acceptable and well-supported bill to provide for scholarship awards. This bill provides an initial $1,000,000, a very meager sum, with increasing amounts to follow, for the stated purpose "of assisting the several states to identify young persons of excellent ability and to provide such persons with resources for continuing their education in institutions of higher education by means of scholarship awards," with provision for additional appropriations of such sums as the Congress may determine. This bill contains what are intended to be specific limitations upon control over education. It states: "Except as otherwise specifically provided, nothing contained in this Act shall be construed to authorize any department, agency, officer, or employee of the United States to exercise any direct supervision or control over the administration, personnel, curriculum, or program of instruction of any educational institution." The bill also provides that the amounts paid to each state for scholarships shall be used in making individual scholarship awards "subject only to the provision of the states' approved plan" to persons within the state who have completed the twelfth year of school, grade, or equivalent, etc. Apparently, there shall be a state scholarship commission in each state and it is contemplated that the administration of the plan will require on the average, not less than $10,000 per state to administer the scholarship program. The bill in tentative form provides for a basic grant of $600 to undergraduate scholarship holders or $1000 in graduate and professional schools and if the holder shall have dependents, the basic grant shall be increased by fifty per cent of the basic grant for the first dependent and twenty per cent for each additional dependent.

The proposal further provides that the award shall be made for a term not exceeding four years as an undergraduate student and four years as a student in graduate or professional curriculum, provided that the scholarship holder remains in good standing and maintains satisfactory standards of scholarship at the institution he is attending. These scholarships may be in addition to any amount earned by a student carrying a "full program of study, but shall not duplicate any aid from Federal sources including educational benefits under the Servicemen's Readjustment Act of 1944 as amended." Among college people, four years as an undergraduate student could mean four academic years which varies as much, perhaps, as 35 per cent in length and content; or the term can be interpreted to mean a calendar year.

In view of the fact that the proposal will place funds to attend college and university in the hands of many young people, it seems quite certain that educators, being human Americans as they are, will endeavor to secure in each institution a maximum proportion of scholarship holders. No provision is included in making the federal grants to assure sufficient or qualified instructional facilities or personnel, it being the assumption that such items exist. Students, of course, will be admitted to institutions for the normal stated fee which, justly, will have to be the same for all students, whether or not federal-scholarship holders. This poses a nice problem for the public universities, and, if our experience under the G. I. Bill is to be any criterion, the woes will be visited upon us promptly when federal-scholarship students swarm upon our campuses choosing the public institutions in preference to most private institutions for the important reason among others, perhaps, that most of the public colleges and universities must provide to citizens of their own states instruction tuition-free. This means, therefore, that there will be required a gigantic increase in the amount which must be provided *by the states* in support of their public colleges and universities. Otherwise there will result an urgent approach to Congress for funds to aid the states in maintaining the public colleges and universities! Since the Federal Government will have made the large enrollment possible, just as it did through the provisions of the G. I. Bill, then it will be logical that the Federal Government which brought about the large demand upon the higher institutions should also fulfill its duty and assist the states to care for the cost incident to maintaining and operating the public colleges and universities!

CRITERION OF PERSONAL NEED NEGLECTED

The proposed scholarship bill, I believe, has been refined to the point where the *need* of the prospective scholarship holder is not to be given consideration. It is still unbecoming for an American to certify to his poverty. Regardless of that, it would be at least politically unwise to distribute funds based upon anything as intangible as need or its measurement. Be that as it may, if the sole criterion for awarding federal scholarships is intellectual capacity, then may not the question be raised that perhaps a large number of prospective scholarship holders really do not need federal-scholarship assistance in order to achieve the higher education, since by and large, the more gifted intellectually are also more gifted in acquiring ways and means of satisfying their desires? If we abandon the element of need in awarding scholarships, in helping people of ability to further develop their ability to help themselves, then I wonder if we are not translating a scholarship program into a mere reward for having been born bright, a handout of charity, and a passport to indifference toward the nation's need.

In the first place, I question the advisability of federal funds used on an individual basis regardless of how worthy the individual unless such use of federal funds will satisfy or meet a demonstrable need for the public welfare, enhance the incentive of the individual to achieve genuine accomplishment, and make a real contribution toward the nation's progress. It is my understanding that a recent study of projected scholarship holders in New York State, based solely upon intellectual competence, resulted in finding that a large percentage of such prospective scholarship holders were already in college and needed no state scholarship to help them achieve their designated objective. If that is the case, would it not be evident that some other method of awarding scholarships than sheer ability to pass objective tests of intellectual ability should be found?

If so, this, of course, involves innumerable difficulties. The difficult problem of administration, I believe, may be the chief reason for eliminating the element of need from a federal scholarship program. Yet, in the language of the suggested

appropriation act, there will be the problem of administration on a federal scale which inevitably leads to administrative red tape and ultimately some interference with the freedom of the institutions of higher learning. I need cite only the difficulties we have had under the G. I. Bill of Rights in support of this contention. The same reservation to protect individual institutions from any interference whatsoever by officers, departments, or any personnel of the Federal Government are to be found in the G. I. Bill, and yet in the matter of making definitions and trying to interpret what is a college program of full time, for example, the Federal Government must cut across and interfere with institutional practices and programs. After four years of operation under the terms of the G. I. Bill, the colleges of the nation are dissatisfied to a considerable extent because they are not paid equitably or because some regulation in supervision of the student cuts across purported traditional academic freedom. The public and elementary schools are similarly reporting difficulty, and the proprietary schools are so angry as to demand Congressional aid which will make of the G. I. Bill merely a generous outpouring of funds in support of any activity which American citizens might determine among themselves to be education!

ADMINISTRATION DIFFICULTIES

I submit then that one of the great difficulties of a program of federal aid to education is to be found in its administration, especially at the higher level where the institutions are relatively few in number and where the funds will be distributed somewhat on an individual basis. The problems which will arise in such administration are enormous. They have not yet been thoroughly analyzed and procedures have not yet been clarified to prevent any such bill from becoming a means of political pressure, nevertheless, and of interference with education.

Since the funds will flow from the Federal Government, the ultimate benefit, if it may be called such, to be derived from such interference should accrue to the general welfare of the nation. However, when federal funds are to be used on such an individual basis, there is always the possibility and the great probability that the use of such funds inevitably will be affected with a political influence which can be dangerous not only to the general welfare, but to the very life of our nation as a society of free individuals.

It is easy to express these reservations and words of caution. It is far more difficult to propose an appropriate way of administering federal scholarships and federal aid to higher education which will not either cut across our individual and institutional freedoms or be extremely wasteful and result in political interference of one sort or another. I for one am not convinced that the Federal Government or any other government, for that matter, should do more than provide us the opportunity to make the most use of our God-given capacity that we can make, provided we exert all of our efforts toward our chosen objectives. If the Federal Government is to provide a scholarship program, it should not be a scholarship program aimed at furnishing the nation with a group of citizens who are trained, in general, at a high level for a conglomeration of objectives without relation to the man-power needs of the nation—the need for these superior persons trained in proper proportion for services which the nation must have from those of superior ability if it is to survive. This means, then, if we have such a scholarship program, it should be a program of scholarships not directed at a group of bright individuals accepting gifts, but one which will establish a sufficient quota of diversified scholars in the nation. We must have a sufficient number of each of the particularly trained individuals as are needed to perform the professional or other necessary services, for example, a sufficient number of doctors, a sufficient number of lawyers, a sufficient number of engineers, a sufficient number of chemists, physicists, bacteriologists, writers, etc., without, at the same time, providing an excess supply clearly out of balance in any one field. In the next place, I cannot believe that gratuity scholarships based upon the ability to pass objective intellectual tests will be other than wasteful, because, unless the individual himself has the desire to learn, no amount of opportunity will make him a valuable citizen. If the individual desires an education, he himself must put forth the main effort to realize his ambition. For that reason, the element of need is important and some quid pro quo will need be considered in determining the amount and the terms of federal scholarships.

AN ALTERNATIVE SUGGESTION

As a specific suggestion of action to prevent federal interference, to insure the widespread distribution of federal funds and the adaptation of individual funds not only to quality of the intellect but to the need of the scholar, I suggest consideration of a plan whereby, let us say, under the appropriation bill now pending in Congress, a small percentage, say, five per cent for purposes of discussion, should be designated as available for advanced scholarships to be awarded to those individuals in the top ten per cent of the graduating high-school class who wish to go to college, the scholarships to be awarded to those in the top ten per cent on the basis of competitive examinations, and the amount of scholarship to be determined by the local school officials and a school governing body in co-operation with the State Board of Education or other unifying agency, to the end that actual need, determined objectively at the local level, will be considered to bring about the widest possible spread and the most effective possible utilization of funds provided to encourage and enable superior high-school graduates of restricted means to secure the benefits of higher education. As a further quid pro quo, such individuals might be required to follow the profession for which they were educated or, if necessary, to render service in their chosen field. Such administration would not overlook the local personal relationship in development, guidance, and need of the individual in any particular situation. Furthermore, it would insure a nationwide upgrading of the educated youth in every area and capitalize on the importance and value of helping the individual to help himself. No one would have his personal responsibility largely shifted to the State.

FEDERAL SUPPORT OF RESEARCH

Another area in which higher education is interested in federal financing is at the graduate level and more particularly in the field of research. During the last decade our major universities have become accustomed to accepting research assignments under contract with the Federal Government. During the period of war many of these assignments were carried on as a public duty and the principles upon which compensation was based were largely noteworthy by their absence. In other words, the schools were paid what might be necessary to do the job which could be done in the shortest possible time. Since the war, however, the urgency of speed has been somewhat abated and the alternatives of the Federal Government in securing the performance of research have increased. Proposals have been made in Congress to appropriate substantial sums of money to finance research, but here again no definite clear-cut method of administration of such funds has been worked out.

The administration will become a series of "regulations" having the force of law and causing the usual series of confusing if not chaotic situations. In this whole matter of federal appropriations, therefore, it seems to me that insufficient study

(*Continued on page 16*)

The ANATOMY *of* NATIONAL INCOME[1]

By MAX F. MILLIKAN

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THE idea of the national income, once a technical concept not frequently found outside the pages of economic treatises, has become the common property of journalists, politicians, businessmen, reformers, commentators, and the man in the street. We hear comparisons of the average incomes of Americans, Englishmen, and Russians; we see correlations between the level of the national income and sales of refrigerators; we are confronted with figures showing how much of the national income goes to the workingman; we follow the twisting course of slump and boom, boomlet and slumplet, in charts graphing the progress of national income quarter by quarter; we are frightened or encouraged, depending on our point of view, by statistics showing the growing proportion of the national income absorbed in government activities.

Yet anyone who has ever had occasion to try to analyze these figures and find out just what is in them knows what a baffling process it can be. For the U. S. Department of Commerce publishes figures on things called "gross national product," "net national product," "national income," "personal income," and "disposable income," and the differences amount to as much as one quarter of the total. A clear exposition of just what lies behind these various totals and how they are put together has long been needed for the use of economists, students, and laymen alike.

This is provided in Professor Ruggles' book.[2] It is not an easy book, and it does not pretend to be an entertaining book, but it is clear and thorough and can be mastered by a persevering reader with no special background in economics. It is divided into two parts, the first of which describes the content of national-income accounts and the sources from which the figures are compiled. The basic ideas of this part are developed in five chapters from which unnecessary detail has been omitted. For those wishing to dig deeper there are appendixes to four of the chapters adding enough specific information to fill the needs of most actual users of national-income data. The book was presumably intended primarily as a textbook, but Part 1 at least is quite comprehensible without benefit of classroom discussion.

The author begins with a description of the kind of accounts we find kept by the individual units of our economy—firms, households, governmental bodies. From these he shows how, in principle, we could derive a set of consolidated accounts for the economy as a whole showing how much the economy as a great productive mechanism turns out every year and how the proceeds are allocated to the various productive services that make that output possible, just as the receipts of a business are allocated to its various elements of cost. Just as we can measure the scale of an enterprise either by the value of its sales or by its total costs and profits, so Professor Ruggles shows how we can think of the productive activity of the nation as a whole either in terms of the market value of the goods it produces or in terms of the income earned in producing those goods.

This emphasis on the way in which the national totals could be built up from the accounts of the units has many virtues. It starts from something most people who actually operate in the economy are familiar with, namely, their own profit-and loss statement. It emphasizes the two-sided nature of national income as value of output on the one hand and value of input on the other. This in turn explains how two entirely independent estimates of the national income can be made, one at the output end of the pipe and the other at the input end, and the two checked against one another. And in the process of building up the consolidated statement all the confusing little differences between the five different things called "income" or "product" are clearly explained so that the reader emerges with a better idea of which measure to use for what purpose. Furthermore, once the process of consolidation has been made clear, it is easy to see how one can stop at any point and observe the contribution to the whole of sectors of the economy of various sizes. We can isolate out the product of (or the part of income originating in) the tobacco industry, or all manufacturing, or all private business, for example. The reviewer knows of no place where the anatomy of national income has been laid bare so clearly or so simply as in this book.

As the medical profession discovered long ago, the study of anatomy is the first step toward an understanding of the functioning organism, and this understanding, in turn, is a prerequisite for intelligent prescription of remedies for common ills. In Part 2 of the book it is made clear that the analysis of the nature and components of national income is of more than statistical interest. For the careful definition and measurement of the level of economic activity and its components suggests fruitful hypotheses as to why it behaves as it does. This should not be surprising. For just as the accounts of the nation must be built upon the accounts of the people and organizations which it comprises, so changes in the nation's economic activity must result from changes in the activities of individual units. The spending of these units gives rise to the accounting entries which we summarize in national-income figures, and also to the fluctuations in national income which we call business cycles. Thus to see what national income consists of is to begin to see at once why it is as unstable as it is.

The surprising thing is that economists should have gone on talking and thinking about depressions and inflations and their causes so long before settling down to take a good look at just what it is that fluctuates and what in detail it is made of. The great contributions which the late Lord Keynes and his intellectual forebears and successors made to our understanding of the functioning of the whole economy did not bear their full fruit until they were married to the results of that patient and less spectacular band of researchers who concerned themselves with national-income measurement. The union is not yet fully consummated. But already many of the controversies which shook the economics profession ten or fifteen years ago look incredibly childish in the light of our better understanding of the structure of national income. There is much that is still in dispute, for example, as to the precise role played by saving and investment in business fluctuations. But it is hard to believe that such almost endless wrangling as to what these terms meant could have raged as it did in the thirties, had a book like Ruggles' volume been at hand at the time.

[1] One of a series of reviews of current economic literature affecting engineering, prepared by members of the Department of Economics and Social Science, Massachusetts Institute of Technology, at the request of the Management Division of The American Society of Mechanical Engineers. Opinions expressed are those of the reviewer.

[2] "An Introduction to National Income and Income Analysis," by Richard Ruggles. McGraw-Hill Book Company, New York, N. Y., 1949. $3.75.

Part 2 is stiffer going than Part 1. The discussion of the dynamics of income determination, of the nature of equilibrium, and of the saving-investment process is perhaps to be recommended more to economists than to the uninitated. But the continuity is such that anyone who has mastered Part 1 has the essential background for Part 2. And anyone who masters Part 2 will find his thinking about the problems of maintaining employment and avoiding inflation very much clarified.

This does not mean that one will find final answers to policy problems in this book. There are too many things we still do not know, too many pieces of the puzzle still missing, for any binding consensus on policy measures in this area to be possible among economists generally. But the kind of analysis developed here clarifies the issues and supplies a framework of ideas within which the relevant questions can be formulated. The author provides a final chapter on policy which I am sure he does not intend as more than an illustration of how the tools of analysis he has developed in earlier chapters can be applied.

Economists can find more to quarrel about in Part 2 than in Part 1, and it will be less widely accepted in the profession as representative of the current state of our knowledge. For example, there is little or no discussion of the part played by the monetary system in economic fluctuations, and no satisfactory treatment of the causes and consequences of various kinds of price behavior for economic stability. This is perhaps natural in view of the fact that these are among the widely disputed issues in the field today. A volume designed to explain what we now know about income fluctuation can perhaps be excused for skirting this swampy ground. But the author can fairly be criticized for not letting his readers in on the fact that the swamp exists. Again, the relation between consumer income and consumer expenditure, which economists call the "consumption function," is described here as a central tool of analysis without much hint of the widespread current disagreements as to the shape of this function, its stability, and its usefulness for analysis.

But these are a colleague's carping counsels of perfection. For anyone, economist or not, who seriously wants to know what national-income statistics mean and how they are derived, Part 1 of this book is to date much the best source. For anyone who has read Part 1, Part 2 offers a logical and convenient introduction to the way many economists are today thinking about the problem of economic fluctuations. That the two are on different levels of consensus is the fault not of the author but of the state of his subject.

1949 ASME Annual Meeting Papers

FOURTEEN pages of digests of available 1949 ASME Annual Meeting preprints appear in this month's ASME TECHNICAL DIGEST, pages 27 to 40. The December, 1949, issue of MECHANICAL ENGINEERING also contained digests of available 1949 Annual Meeting preprints, as will forthcoming issues.

This month's TECHNICAL DIGEST covers a wide variety of subject matter, including gas-turbine locomotives, absorption refrigeration, control systems, plastics testing, applied mechanics, gas-turbine power, fly-ash disposal, fluid meters, heat transfer, engine noise reduction, properties of gases, machine design, boiler-feedwater studies, fuels, pressure vessels, lubrication, and reheat turbines.

The Implication of Federal Support of Education and Research

(*Continued from page 14*)

is being given to the problem of just how federal funds will be administered to protect the Federal Government on the one hand against waste, against the natural urge of the individual citizen to make as favorable a deal as possible in securing and using such funds, and on the other hand to protect our educational system so as to maintain that type of intellectual freedom which is essential in colleges and universities where not only facts and material relationships are important, but intangible ideologies also find fertile ground for development. Any time there is an easy possibility for these to be directed through a central agency, the nation is in danger.

I have no objection to a single federal college or, for that matter, to a limited system of federal higher education and to a limited system of federal research, but I do believe it is important if we are to maintain our economic as well as our intellectual freedom, and I do believe these two freedoms are interdependent, that at least the use of federal funds in education for teaching and for research should not become universal or unduly controlled at the central source. Here administration is all-important and the Federal Government seems just too big to administer the details of programs so much involved on an individual basis.

Our strength lies in the diversity of our interests and the competition of those interests and, if you please, the competition between institutions of higher learning which motivates all of us to improve, to grow, to adapt, and to excel. Though our ultimate objective may be identical, our methods should be different and each should have the right of choice so long as our inherent safety is not endangered by extravagence, waste, and that type of competition which is aimed at destruction rather than the excellence of performance.

PROBLEM OF TAXATION

One other area in which higher education is encountering increasing attention of the Federal Government is in the matter of taxation. Bills are introduced which go to the extreme of taxing the entire income of colleges and universities regardless of the source from which that income is derived. Attacks are made upon the colleges and universities for endeavoring to secure an undue amount of government contract research, especially that of an applied nature; for owning and operating commercial businesses under the guise of investments; to increase the yield on endowments; and for many other activities. The more higher education becomes subjected to the Federal Goverment for support, the less freedom will remain to the institutions as agencies operating within the several states to best serve the diverse needs of the different states and the many economic and intellectual interests to be found among our people.

It is not *money* which is the root of all evil, but it is the love of money which causes the trouble, and in the case of federal money, it is not the evil of federal money in and of itself, but the evils which exist in poorly planned administration of federal appropriations, especially those of a continuing and individualized nature, which are to be feared. It is against the careless entry into a federal relationship without first having written the prescription for adequate administration that I warn this group, and through you, the higher educational institutions of America. What we need is more educational opportunity in America, not more subsidy and less effort in the individual use of that opportunity.

BRIEFING THE RECORD

Abstracts and Comments Based on Current Periodicals and Events

COMPILED AND EDITED BY J. J. JAKLITSCH, JR.

MATERIAL for these pages is assembled from numerous sources and aims to cover a broad range of subject matter. While few quotation marks are used, passages that are directly quoted are obvious from the context and credit to original sources is given.

Radiobiological Research

THE study of the long-term effects of atomic-bomb radiation has made a 400-square-mile research laboratory out of the lagoon of lonely Bikini atoll where two bombs were exploded over and under water more than three years ago. According to the Atomic Energy Commission, radioactivity is declining but still is detectable throughout the coral reef that circles the lagoon. External radiation is not dangerous except, perhaps, at the bottom of the lagoon some 200 feet under the surface. Enough radioactive material probably exists to be ultimately dangerous to rats, crabs, and fish if they take the substance into their bodies, or to men if they were to eat for some time the fish from the lagoon or the coconuts from the island's palm trees.

The University of Washington's Applied Fisheries Laboratory made a survey in 1947 and again a little more than a year ago for the Commission. Investigators took samples of plant and animal life, particularly of fish, clams, oysters, and such creatures off the reefs at depths of 35 to 40 feet. Navy divers took other biological samples at depths up to 200 feet. Scientists recorded the type and weight of samples, then reduced them to ash with electric ovens and acid, and examined tissue residues for radioactivity. Marine plants such as algae and plankton—animals from the size of tiny one-celled protozoa to jellyfish—were also taken and studied.

The scientists found that, in 1948, sand and coral was relatively free of radioactivity. Plants, animals, and fish had gradually accumulated radioactive material, but not enough to cause observable harm to their tissues. They did not accumulate radioactive forms of material more rapidly than they would normal types of the same substance, but because of the scarcity of normal forms of certain elements algae would accumulate trace quantities of radioactive minerals. Fish then fed on algae and plankton; crabs, rats, and birds fed on the fish, and accumulations occurred in this way. When any of these creatures died, the materials were released into the earth or water by decay and once more could recycle through the same chains of food: algae to fish and animals. Roots of palms and pandanus trees, reaching deeply through the porous earth and coral, tapped brackish water containing radioactive materials and radioactive substances entered the food cycles of animals and birds that fed upon such plants.

The scientists who made the survey expected that this pattern would continue for a considerable period, until the radioactive materials lost their power to radiate, but that the possible hazards to plants and animals would gradually decline.

During 1949, University of Washington scientists made another resurvey of Bikini atoll, and according to an article by Neal O. Hines, in the October, 1949, issue of the University Bulletin, radioactivity at Bikini now is of low strength, but it is not leaving the atoll as rapidly as most observers expected. Instead, it is being picked up by living forms and concentrated in living tissues.

The radioactivity at Bikini has changed in character, or, rather, new forms now are dominant. In 1946 gamma radiation was everywhere, jamming Geiger counters. In 1949 existing radiation apparently was largely composed of the low-penetration forms, alpha and beta, which are dangerous if taken into living bodies.

The radioactivity at Bikini is circulating, being carried about the lagoon and to the land masses by small and microscopic organisms which have ingested it.

The radioactivity has moved, by absorption, into the coconut palms and other plants which send their roots into the porous sand and coral of the land masses.

Above all, radioactivity still is present at Bikini in measurable amounts.

Stated thus bluntly, writes Mr. Hines, the observations may have little meaning—or too much. There are men who, noting that Bikini's radioactivity is of low power, believe that the danger of radioactivity no longer exists. But what the University teams have shown is that the radioactivity, picked up in trace quantities by fish or other life, can be concentrated in living tissue until it becomes dangerous.

The underwater explosion at Bikini released into Bikini lagoon vast quantities of radioactive by-products. In 1946 there was a considerable feeling that these products, admittedly very dangerous, would tend to decay and disappear rather quickly by normal dilution in the waters of the 400 square miles of lagoon. This has not happened. The University studies revealed measurable quantities of radioactivity in 1948, and

How to Obtain Further Information on "Briefing the Record" Items

MATERIAL for this section is abstracted from: (1) technical magazines; (2) news stories and releases of manufacturers, Government agencies, and other institutions; and (3) ASME technical papers not preprinted for meetings. Abstracts of ASME preprints will be found in the "ASME Technical Digest" section.

For the texts from which the abstracts of the "Briefing the Record" section are prepared, the reader is referred to the original sources, i.e.: (1) The technical magazine mentioned in the abstract, which is on file in the Engineering Societies Library, 29 West 39th St., New York 18, N. Y., and other libraries. (2) The manufacturer, Government agency, or other institution referred to in the abstract. (3) The Engineering Societies Library for ASME papers not preprinted for meetings. Only the original manuscripts of these papers are available. Photostat copies may be purchased from the Library at usual rates, 40 cents per page.

again in 1949. The quantities are minute, but the activity remains despite the sun, wind, rain, and natural dilution. This is true because living organisms are storing the radioactivity, holding it in Bikini's life cycles. Never before have scientists had opportunity to observe so intimately the fascinating patterns worked out by the passage of these fission materials through the food chains and circulatory systems of a natural environment. The underwater bomb made of Bikini a laboratory in which studies may continue for years.

That, in essence, is the lesson of Bikini, Mr. Hines states. The atom bomb is the explosive expression of atomic fission, but it is not explosion alone. The blast is the release of radioactive forces which may have overpoweringly significant biological effects. The Washington surveys indicate that the world must prepare to think of the bomb as a weapon with long-range consequences which are only beginning to be measured.

Heat Pumps

UTILIZATION of the heat pump, a year-round space-conditioning device, has progressed rapidly here in the United States during the past two years, E. N. Kemler, associate director, Southwest Research Institute, Houston, Texas, told a meeting of the Fuels and Energy Section of UNSCCUR, held at Lake Success, L. I., N. Y., recently.

He pointed out that the earlier installations in this country by Southern California Edison and American Gas and Electric Corporation have been to small office buildings. More recent installations by the New Haven Power and Light Company and the Equitable Building in Portland, Ore., however, represent the continued trend both with regard to size and economic advantage of the heat pump. These applications of the heat pump have been made because cooling as well as heating is required. The heat pump as a year-round type of comfort-producing device fills an economic need. The Portland application, being in a hydroelectric area, results in reduction of basic-energy requirements. This 550-hp installation is now the largest in the United States.

Heat-pump units for residential and small commercial uses are of a packaged type. These units have been almost exclusively used in this country and primarily in areas where cooling as well as heating is desired. The generally low cost and availability of fuel for heating in the United States does not make the heat pump attractive for residential use when considered for heating alone. Its principal advantage arises from the fact that it furnishes cooling as well as heating with the same mechanical equipment. The electrically operated heat pump, however, can compete on an economic basis with other types of basic energy.

The most recent development in the heat-pump field has been a gas-engine-driven heat pump. This device has a coefficient performance (ratio of heat output to heat equivalent of gas input) of approximately two. This means therefore that when utilizing some basic form of prime mover such as the gas engine to drive the heat pump, the requirements of fuel are reduced approximately one half for the heating function. This same general principle would appear to apply to any other type of prime mover which might utilize basic energy. Some of the potentialities in this direction are the utilization of the Diesel engines and in the case of larger installations, the possibilities of utilizing a coal-burning gas turbine as a basis for conversion of energy. Such applications would apply to small buildings and apartment houses. Under these conditions, reductions in the amount of fuel by a factor of perhaps two when producing heating would be accomplished. This type of installation is particularly attractive where the heating load is considerably larger than the cooling load.

The installations which have been made in the United States vary from the 550-hp installation in the Portland Equitable Building to the 3-hp packaged-type unit available for residential use. There are approximately 150 commercial installations and 110 residential installations in the U. S. There are many other installations on which reports have not been furnished and there are likewise many experimental installations. Installations have been made in all of the Pacific Coast and Gulf Coast states. These areas are particularly adaptable for use of the heat pump in that cooling is a desirable feature for a considerable portion of the year and the heating requirements are not severe. The installations of the heat pump have not, however, been limited to these areas as installations have been made in South Dakota, Wisconsin, New York, Pennsylvania, and practically all of the North Central States. When it is considered that most of these installations have been made within the two-year period, it indicates a very rapid development of the heat pump. This number of installations, while not proving conclusively that the heat pump is a factor in the over-all space-conditioning field, does show that a great deal of progress has been made and that continued developments are to be expected. In those areas in which cooling is an important factor, enthusiastic response to the heat pump has been reported.

Diesel Railroad Maintenance

THE change from steam to Diesel-electric motive power which is taking place throughout the country is having a far-reaching effect on maintenance facilities. The two types of power are substantially different in so far as maintenance requirements are concerned, and it is necessary that extensive changes in facilities be made. Some of the existing steam-locomotive facilities will be abandoned, others will be remodeled, and some new installations are required. In a paper which he presented at the 1949 ASME Semi-Annual Meeting, held in San Francisco, Calif., F. E. Russell, superintendent of motive power of the Southern Pacific Company, Sacramento, Calif., outlined the requirements for efficient Diesel-locomotive maintenance and repair.

He pointed out that while the number of Diesel-electric locomotives is steadily increasing, steam locomotives still greatly outnumber the Diesels and will for the next few years. It is therefore necessary for the railroads to have maintenance facilities for both types of power.

In some cases, for instance when the Diesels are switchers and road switchers, the same facilities can be used for steam and Diesel, although some additions and modifications are necessary to make them suitable for Diesel maintenance. Existing round houses and inspection pits are satisfactory, but some special tools for working on Diesel engines and electrical equipment are required, and fueling, engine cooling water, and sanding facilities must be installed. For heavy repairs, existing shops where pits and necessary lifting equipment are available can be used.

For Diesel-electric road locomotives, new or completely remodeled facilities are required for routine maintenance and running repairs. It is imperative that these facilities be so located and constructed that a minimum of time will be required for maintenance. The initial cost of Diesel-electric power is considerably higher than that of steam, and to offset this higher first cost modern facilities which will make possible maximum availability and efficient utilization must be provided. Existing steam-locomotive facilities are not suita-

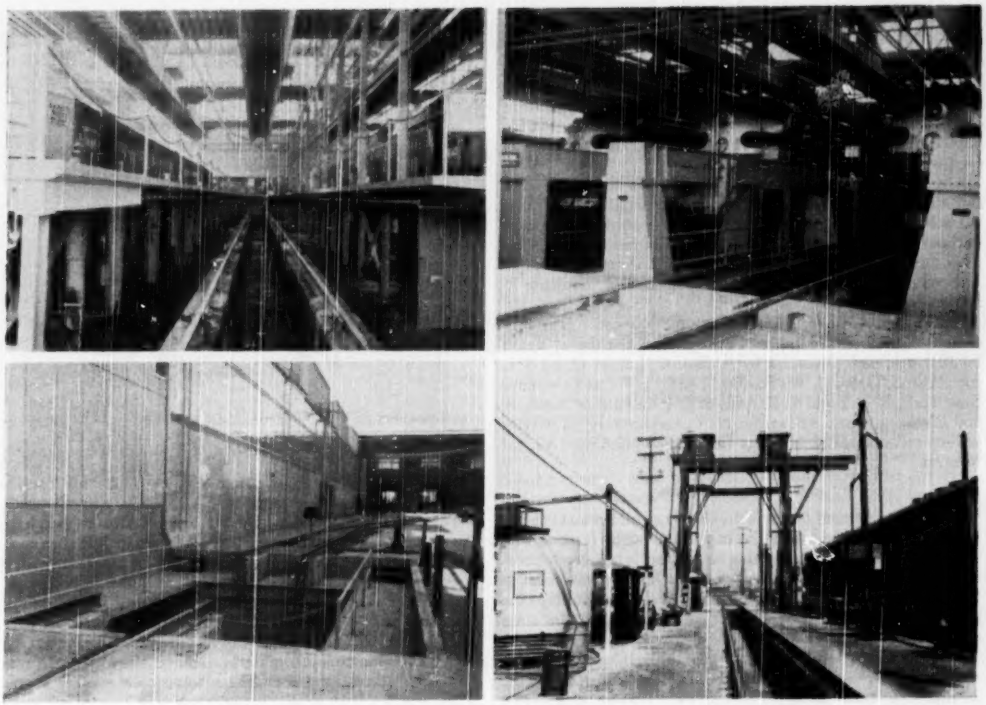


FIG. 1 SOUTHERN PACIFIC'S DIESEL-ELECTRIC ROAD LOCOMOTIVE MAINTENANCE SHOP AT TAYLOR YARD IN LOS ANGELES, CALIF.

(*Top left:* One of six 215-ft-long inspection pits; *top right:* over-all view showing Diesels on maintenance tracks; *bottom left:* one of two drop pits, used for changing trucks; *bottom right:* one of three 2-ton overhead cranes to facilitate removal of locomotive parts.)

ble. Heavy repairs to these locomotives can be handled in existing steam repair shops. However, it is necessary that work platforms and benches be installed, and in many cases some rearrangement of the shop is desirable. At intermediate points and turn-around or nonmaintenance terminals no extensive changes to facilities are necessary. Requirements at intermediate points are dependent on the length of run, and where necessary, fueling, cooling water, and sanding facilities are installed. In addition, at nonmaintenance terminals, facilities must be provided for making inspections required by the Interstate Commerce Commission, and for making minor repairs when necessary.

The shape of most roundhouses, with all tracks converging at the turntable, is such that the required space for efficient inspection and servicing is not available. Multiple-unit Diesel locomotives are so long that if they are taken into a roundhouse over the turntable they will either extend onto the turntable or it will be necessary to separate the units, with consequent loss of time and availability. The multiple-unit Diesel locomotive cannot be turned on the normal turntable due to its length. As an example of the difference between the two types of power, a four-unit Diesel freight locomotive is 201 ft $6^1/_4$ in. long, while the largest steam locomotive on the Southern Pacific has a total length including tender, of 125 ft 5 in.

It has been determined from experience that the most suitable type building for Diesel-locomotive maintenance is one which is generally rectangular in shape, with tracks running through it if possible, and having track pits and proper working space around the locomotive. The latter includes a depressed floor level between the pit rails to facilitate truck work and inspection of brake equipment, and an elevated platform at locomotive floor level. Pits must be of sufficient depth, and must be well drained and well lighted.

Other basic requirements for the Diesel-locomotive maintenance shop include cranes for lifting material out through the roof of the locomotive, facilities for removing wheels and traction motors or trucks, and supply lines for fuel, lubricating oil, and cooling water. Included as part of the shop or located in the immediate vicinity should be a small machine shop, electric repair room, air-brake and piping room, filter-cleaning room, lubricating-oil testing and reclamation facilities and storage, fuel-oil storage, sanding, and cooling-water facilities, a machine for washing locomotive exteriors, and battery-charging equipment. Some of these facilities, such as the machine shop, electric shop, and air-brake and piping room, are already in existence at locations where steam locomotives have been maintained. Others must be provided when the Diesel maintenance shop is established. Another important factor in efficient maintenance of Diesel locomotives is proper store facilities at a convenient location with respect to the service areas. This is necessary in order that worn parts can be removed and new or rebuilt parts applied to the locomotive while in shop with a minimum of delay.

Nonmetallic Bearings

SOFT rubber and rubberlike synthetic compositions have been used as materials for water-lubricated bearings for more than 25 years. They have shown important operating efficiencies and economies in pumping equipment, on marine propeller shafts, dredge cutter shafts, and similar applications, even when severe conditions exist.

Recently, nylon's good bearing quality has been discovered and it also is finding steadily increasing industrial uses. Nylon has a low coefficient of friction; it has the ability to be used without lubrication at light loads; its tolerances are somewhat less critical than with metal bearings; it is abrasion-resistant; and, very important, it may be injection molded, resulting in low cost.

Soft-rubber bearings, friction tests of flow-controlled continuous-film-lubricated rubber bearings, and the use of nylon for bearings, were discussed by A. Bednar, Lucian Q. Moffitt, Inc., Akron, Ohio; J. W. Stanley, The E. J. Willis Company, New York, N. Y.; and R. B. Akin of E. I. du Pont de Nemours and Company, Inc., Arlington, N. J., respectively, at a symposium on nonmetallic bearings during the 1948 ASME Annual Meeting.

SOFT RUBBER BEARINGS

Mr. Bednar pointed out that the ability of rubber and rubberlike materials to deform is the important factor in their successful performance when using water or other low-viscosity liquids as lubricants, and when operating in abrasive-laden liquids. The flexible bearing surface easily adjusts itself to the minute irregularities in the shaft and so permits the comparatively thin-film characteristics of low-viscosity lubricants to be established and maintained. The flexible property of the rubber provides another advantage on high-speed shafts in that it permits the shaft to turn on its center of gyration when it does not coincide strictly with its geometric center, thus reducing vibration and stresses in the bearings and supporting structure. Similarly, the deformation of the rubber helps to reduce stresses in cases of certain degrees of misalignment, which are frequently encountered on long shaft installations.

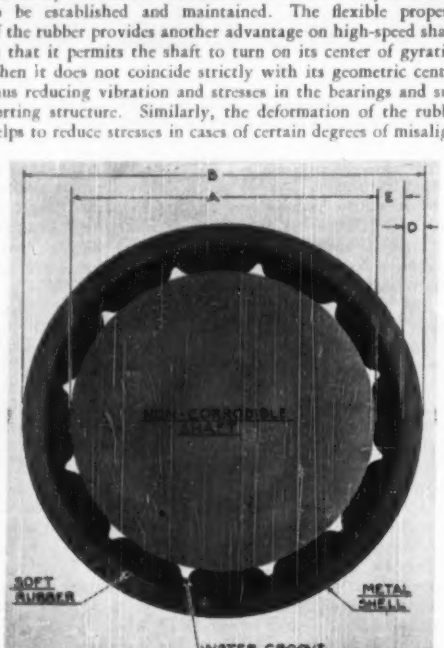


FIG. 2 CROSS SECTION OF FULL-MOLDED-TYPE RUBBER BEARING

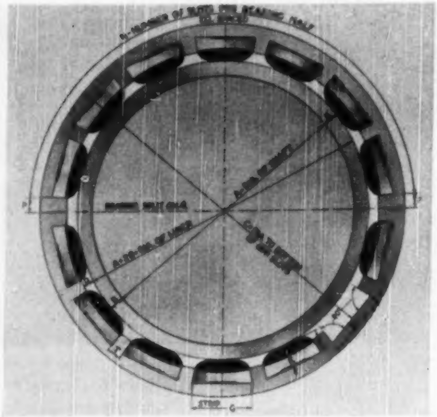


FIG. 3 CROSS SECTION OF SEGMENTAL-TYPE RUBBER BEARING

The upper limit of speed for water-lubricated rubber bearings has not been determined. Laboratory tests have been conducted up to speeds of approximately 1500 fpm, which would cover most of the operating ranges. In some special applications, for example in racing boats, speeds of 12,000 rpm on $1^3/_8$-in. shafts (4300 fpm) have been attained, and rubber bearings used on boats of this class in record runs, tests, and actual races, covering months of service, have shown no distress. Rubber bearings have been in continuous service for several years now on high-head hydraulic turbines located in mountainous areas, having shaft speeds in the range of 500 rpm, on 15-in-diam shafts, or surface speeds of almost 2000 fpm.

Multiple-face type rubber bearings are currently constructed in two principal designs, each having some variations to suit conditions of service. One is the so-called full-molded type, and the other the segmental construction. In the former, the rubber is molded to shape and extends in continuous lining around the shaft. Generally, the bearing material is formed and bonded inside of a suitable metal shell. Since the molding process is subject to considerable dimensional variation, the bearings are finished by grinding the inside surface for proper fit on the shaft. This then produces a bearing surface conforming approximately to the shaft radius. Bearings of standard construction, that is, those intended for stock purposes, are made with naval brass composition shells (nominally 63 per cent copper, $1^1/_2$ per cent tin, and the balance zinc). This metal has been found to have good corrosion resistance to practically all water, including sea water, and has sufficient strength and rigidity to provide ample stability for the bearing lining.

Segmental-type bearings are adapted particularly to large-sized shafts. The predominant feature is the facility of installation. The bearing faces take the form of individual segments, or strips, consisting of the bearing material bonded to metal, or other suitable backing. The rubber is molded to shape and ground to finished thickness.

All of the designs and construction described by Mr. Bednar are being made with synthetic rubber compounds of the oil-resisting variety. Experience in service confirms that these synthetic rubbers have as good, or better, wearing and friction properties than the best natural-rubber compounds. They offer better resistance to heat and, of course, are not adversely affected by contact with oil or oily waters.

Present-type rubber bearings are being used at elevated temperatures up to about 180 F. However, for such applications, initial clearances are increased sufficiently to allow for the expansion of the bearing material, caused by those temperatures.

FRICTION-TESTS REPORT

The results of tests made on the Willis rotary rubber bearing, a full-molded water-lubricated type, as reported by Mr. Stanley, show that the bearing has superior friction properties from low to high speeds over the conventional-type rubber bearing. Operations in abrasive-contaminated water showed very little wear on the rubber component, all the wear being taken by the bronze parts. The wear causes no damage to the shaft as the rotor is fitted onto the shaft and is locked in position to rotate with the member.

This special bearing consists of two main parts: The shaft sleeve and the mating bronze sleeve.

The shaft sleeve, to which is molded the rubber journal, fits onto and rotates with the shaft. The mating bronze sleeve fits into the journal box. Two parallel grooves are cut axially on the inside periphery of the bushing and these control the direction of the flow of water through the bearing. This bearing acts as a pump supplying its own lubrication. It regulates and controls its lubrication with each change of speed and loading.

FIG. 4 EXPLODED VIEW OF FLANGED-SLEEVE-TYPE RUBBER BEARING

The following three friction tests were made on this bearing: A dynamic friction test; a starting friction test; and an accelerated-wear test in sand-contaminated water (1 per cent by weight).

The bearing tested was for a $5^{1}/_{4}$-in. shaft, the rubber rotor was 7 in. OD, and 14 in. long. The outside bushing was made of centrifugally cast valve bronze, Rockwell B-24-27, and the rubber journal of natural rubber, 66-67 Durometer.

The friction tests showed that at low shaft speeds the friction torque was comparatively low, and that with increased shaft speed the friction torque decreased.

The starting friction tests showed that starting friction at all loads was not as high as had been experienced previously in submerged rubber bearings. Power consumption over the entire range from starting to high speeds was comparatively low.

The accelerated-wear tests showed that the bronze component wore approximately five times that of the rubber component, the rubber component wearing only a few thousandths of an inch.

NYLON BEARINGS

Mr. Akin revealed that a dozen types of nylon are now in commercial production as plastic molding powders. For most mechanical purposes, the nylon designated FM-10001 is used; this type is the most rigid, has the highest softening temperature, and also is the least expensive. This type of nylon is handled by the injection molding process, and many custom molders are experienced in handling this material. Bearings may be molded to shape, or blocks may be molded for machining where the number of pieces is not great enough to warrant molds of special shapes.

To determine the limiting conditions for use of nylon bearings, the du Pont Company undertook a project at Battelle Memorial Institute in which preliminary data were acquired on systems where nylon runs against nylon, against cold-rolled steel, and against brass. Each of these pairs was studied dry, lubricated with distilled water (or water with neutral potassium dichromate to minimize corrosion), and lubricated with SAE 10 or SAE 30 oil.

A Neely bearing tester was used in the Battelle studies. Sleeve bearings were driven by variable-speed motors with predetermined loads on the bearings.

From the Neely data, it was found, tentatively, that nylon to nylon is best in each of the lubricant conditions; steel on nylon is nearly as good as nylon on nylon; increase in speed sixfold above original test range of 156 fpm has no significant effect; and limiting loads appear to be: oil—1550 psi, water—1050 psi, none—550 psi.

In actual sleeve bearings, as expected, where a metal journal is used, heat is conducted away from the nylon bearing surface so that a metal-to-nylon bearing may be better than a nylon-to-nylon contact.

Where lubrication was ample, nylon to brass showed poorer results than the other two pairs since the brass used showed some flaking of small brass particles. These embedded in the resilient nylon and scored the brass shaft. In most tests, brass was about the same as steel; in the more severe tests, the brass results seemed confused by the flaking action.

On the sleeve tests, within a range of speeds of 180 to 2500 rpm, speed had no effect on load capacity or wear.

In general, excessive loading, inadequate lubrication, or poor mounting lead to the same sort of failure. The nylon heats up, expands, and may thereby seize the rotating shaft more tightly, accelerating the heating. Where local heating may bring nylon to above 350 F, there will be a flow of nylon from the inside diameter of the sleeve bushing, resulting in an extruded fin at the ends of the bearing.

At lower temperatures, the strains normally in an injection-molded piece may be released, permitting some warpage. This may increase or lessen the load, and thus the molding design becomes an important factor in setting recommended conditions for use of nylon bearings. This factor and others are the subjects of continuing study.

Chromium-Plated Steels

IN addition to decorative use on such articles as automotive headlights and bathroom fixtures, chromium plating is widely used on gages, cylinder walls, piston rings, and other machine parts where resistance to wear is an important factor. However, the advantages of chromium plating, in the absence of proper precautions, may be offset by the adverse effect of the plating on the fatigue limit of the base metal. Recently Hugh L. Logan of the National Bureau of Standards made an extensive study of the effect of chromium plating on the fatigue limit of steels used in aircraft. This investigation, sponsored by the Bureau of Aeronautics, Department of the Navy, provides information of interest not only to aircraft manufacturers but also to a number of other industries which produce or utilize chromium-plated machine parts.

Specimens about 1.4 in. in diam were machined from three lots of SAE X4130 rod and one lot of 6130 rod. The X4130 steel was either normalized to a Rockwell hardness of 90-B or quenched and tempered to a hardness of about Rockwell 40-C, while the 6130 steel was quenched and tempered to a Rockwell hardness of 33-C. After grinding, polishing, and chromium plating, the specimens were subjected to fatigue

tests in the R. R. Moore type of rotating-beam machine operating at 1800 or 3600 rpm. Eight or 10 specimens usually were required to obtain the fatigue limit for any one set of conditions.

In all cases chromium plating was found to reduce the fatigue limits of the steels studied, although the effect was less pronounced under some conditions than others. In general, the reduction in fatigue limit increased with increased hardness of the steels. For steel of a given hardness, the fatigue limit decreased with increased temperature of the plating bath. While plate thickness appeared to have little effect on the fatigue limit of specimens plated in a bath at 55 C and a current density of 350 amp per sq ft, no generalizations could be made regarding the effect of this factor at other current densities and temperatures.

It was discovered that the fatigue limits of specimens plated and subsequently ground to remove a part of the plating were equal to or greater than those of specimens initially plated to the same thickness as the ground specimens and tested as plated. Other experiments show that interruptions of the plating process did not reduce the fatigue limit of the plated specimens provided proper precautions were taken for continuing the plating.

Chromium-plated objects often are heated to temperatures between 90 and 200 C with the object of improving their mechanical properties by expelling the hydrogen deposited with the chromium. A systematic study was therefore made of the effect of heating on the fatigue limit of chromium-plated steel. The results showed that the fatigue limits of quenched and tempered specimens heated after plating decreased to a minimum value for some heating temperature between 100 and 300 C and thereafter increased with increased heating temperatures. Fatigue limits of specimens heated for 1 hr at 440 C in some cases were 87.5 per cent of that of the unplated steel, whereas fatigue limits of specimens plated but not heated, and of specimens heated 1 hr (in air) at 193 C, were only about 68 and 27 per cent, respectively, of those of the unplated steel.

Various tests and observations led to the conclusion that the decreased fatigue limit accompanying the heating at 200 C of the plated fatigue-test specimens was due to increased tensile stresses induced in the chromium plate. This conclusion has been further substantiated by experiments showing that electrodeposited chromium subjected to a heating-and-cooling cycle increases in density and thereby contracts; since no significant dimensional changes occur in the steel upon completion of the cycle, the steel tends to restrain the complete shrinkage of the chromium layer and thereby increases the tensile stresses in it. If the chromium-plated steel is heated to a sufficiently high temperature (above 400 C), the contractive forces in the chromium produce sufficient tensile stresses to cause plastic flow or rupture of the chromium plate, thus relieving the residual tensile stresses in it.

Electron-Optical Shadow Method

THE electron-optical shadow method, a new technique developed by Dr. L. L. Marton and associates of the National Bureau of Standards, makes it possible to photograph and study quantitatively electrostatic and magnetic fields of extremely small dimensions. It thus provides a powerful tool for exploring fields that have not been susceptible to other methods of investigation, for example, the fringe fields from the small domains of spontaneous magnetization in ferromagnetic materials.

In Fig. 5 (top), the method is illustrated by an analogous experiment in light optics. A mounted-lens system (left) converges light from a distant source to form a reduced image of the source at a point ahead of a wire screen (center). A magnified shadow image of the wire screen is then formed (right) by projection from the reduced image. If the lower half of the light beam is intercepted by a piece of plastic deformed along its edge in such a way as to deflect some of the light rays, the result is a distortion of the corresponding part of the shadow network on the screen. In the electron optical shadow method, the glass-lens system is replaced by an electron lens, and the distorted plastic by a magnetic or electric field.

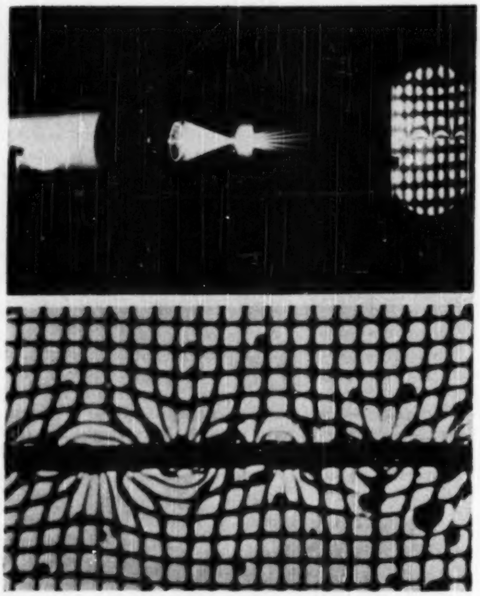


FIG. 5 ELECTRON-OPTICAL SHADOW METHOD

(This photograph was awarded first prize in the Third Annual International Photography-in-Science Salon of the American Association for the Advancement of Science, September, 1949.)

A photograph of a typical pattern is shown in Fig. 5 (bottom). Superposed on the image of a magnetic recording wire is the electron shadow of a fine wire mesh placed just beyond the back focus of an electron lens. From the displacement and reduced magnification of a selected part of the mesh, the absolute value of the magnetic-field intensity at a corresponding point in the field can be accurately computed.

Industrial-Training Films

HIGHER productivity is the first step to prosperity and to higher standards of living and industrial films should play an important part in any productivity drive, Serge A. Birn, Mem. ASME, consulting management engineer, Louisville, Ky., said in an address which he gave at the First Pan-American Engineering Congress held in Rio de Janeiro, Brazil, July 15 to 24, 1949.

The subject for the address originated when, during a recent visit to France and other European countries, Mr. Birn found that very little was known about industrial films. Further-

more, it was found that the United States did not do anything to supply American industrial films to European industries, so as to accelerate recovery. Both the Marshall Plan people and the U. S. Information Service of the State Department were guilty of the same mistake in taking for granted that Europeans are familiar with U. S. industrial-film development.

The National Management Council took the problem under advisement. As a result, Marshall Plan financial assistance was secured and industrial films are now flowing to Europe. They will be screened by Europeans and dubbed into other languages.

Mr. Birn emphasized that the great value of industrial films is not questioned any more. Management may sometimes refrain from the use of films because of the cost, and cost may be high. But it is generally admitted that they help greatly in solving management problems.

An industrial film falls naturally into two parts: the problem facing management and the solution offered. A clear and simple exposition of the problem is the first thing a good film should do. Its purpose is to help people understand the problem. The solution offered comes next. A good film should command attention and stir imagination. It will make old things appear new, shed new light on well-known and forgotten solutions, etc. Oral instructions alone will always seem unconvincing in comparison with a good film.

The most important applications of industrial films in the U. S. are listed in the "Industrial Films for Europe" program of the National Management Council, as approved by Marshall Plan authorities.

The types of films to be selected, in order of importance, are as follows:

1 Those dealing with improvements of work method, showing simple working processes, "before" and "after" improvement of the methods, etc. These films are designed to increase productivity, and are applicable to a broad range of industrial and commercial activities.

2 Information films explaining that high production is necessary to raise standards of living.

3 Films showing increased productivity brought about by using better material and equipment.

4 Films to train workers in the use of production tools, and safety films.

Films made by private companies to promote sales or industrial methods which must be developed to use a certain product are of course not included in the list. But even sales films have some educational value. In fact, in some industrial films it is often difficult to trace the dividing line between educational and sales-promotion features.

Three categories of industrial films were listed by Mr. Birn—the old-fashioned silent movie film, the sound movie film, and the sound slide film. Each has its own role to play; they are supplementary to each other rather than interchangeable educational tools.

A movie film will be shown to great advantage, for instance, in analyzing the motions of an operator, comparing inefficient motions and improved methods, explaining how a 4-cycle engine operates, and the like. It is obvious that in certain programs one kind of film will be used, in others—another. When a coherent visual lesson is presented, amplified with explanations and comments, the slide film is superior. When an intangible idea has to be sold to an audience, as in the case of industrial relations, the sound movie film is the only effective tool. When methods improvements are shown, silent movie films can do nearly as good a job as sound movies, at much lower cost.

Lower cost is the important advantage of slide films. Their cost of production may be as much as five times lower than that of the sound movie. The projection equipment is less costly too. When color is essential, the additional expense is lower with slide films, because much shorter strips of film are used.

According to Mr. Birn, the most important sources of industrial films are the universities; trade associations and manufacturers' societies; private industrial firms, railroads, banks; private engineering consultants, like the Methods Engineering Council; agencies of the U. S. Government, like the U. S. Office of Education, the Army and Navy, U. S. Bureau of Mines; and commercial film producers.

Mr. Birn pointed out that there are of course some problems which confront a prospective foreign user of American Industrial Films. Silent films showing method improvements or similar technical subjects may usually be used with a foreign audience without any adaptation, so long as equipment or product shown are known.

When sound is used, the foreign user is faced with the necessity of translating the talking part. In this respect, the slide film has the great advantage of low cost and simplicity—provided of course the subject matter lends itself to slide-film treatment.

When translating the record narration of the slide film, the original text should not be followed blindly. Provided the rather loose synchronization of record and film is maintained, the text can be modified, corresponding to local requirements.

With a movie the only satisfactory solution is dubbing-in with the foreign language, although costs are high. The use of subtitles is not satisfactory.

When there is a choice between slide film and movie film of comparable quality, the foreign user will be well advised to choose the first. He will easily adapt the imported slide film to the needs and level of his audience. He will avail himself fully of the flexibility of the slide film. The success of a training program may often depend on a well-made adaptation of the narration, and much care should be given to it. Incompetency and carelessness may ruin a good film. The best advice is to enlist trained professional help.

Mr. Birn recommended that a foreign prospective user of industrial films get started in the following manner:

The user should determine the most urgent problem for the solution of which he needs films. Even after the prospective user has properly analyzed his trouble and its causes, he usually will not be able to select the right films because he is not familiar with the available film material. In this case, he can easily be helped by a competent correspondent in the U. S. A.—a university, a commercial film-renting enterprise, a trade association, an engineering firm, or the management group created specifically to foster international good-neighbor relations in scientific management—the National Management Council. Cost is also a serious obstacle to final selection abroad. While film rental in this country is nominal—a few dollars for a day or two, with no extra charge for mailing time—the rental of films for screening abroad will cost much more because of distance and longer time element. Cost of air mail may be prohibitive.

A possible solution might be forthcoming. The Comité National d'Organisation Française will participate in the final selection of American industrial films sent to France by the National Management Council. The chances are that a selection of good American films screened out by Frenchmen for France, could be suitable for South America. There is the common Latin background, and industrial conditions and customs in South America are probably similar to those of the industrialized European countries. The opinion on American industrial films of independent European management societies, such as the French Comité National, and the mere fact that certain American films have been selected by

Europeans, should offer reasonable assurance that these films are suitable for South America.

If the film is a sound movie, the dubbing-in in the native language can best be handled locally. It can be done by any well-equipped film studio. Also, some American universities, notably the University of Iowa, are equipped for dubbing-in in almost any foreign language.

Only after a foreign user has gained sufficient experience with imported industrial films, should he consider the possibility of having custom films made up for his company, with a script especially prepared for him.

National production of industrial films should be encouraged as much as possible, Mr. Birn said. U. S. advisory help to get started might be enlisted, so as to take advantage of the extensive American know-how in industrial-film production. Another method would be to adapt good American films, or scripts of such films to local conditions, if necessary by making them over.

Smoke Control

IN a further effort to co-operate with the smoke-control program, the railroads serving Allegheny County, Pa., and the bituminous-coal industry have launched a research and development project aimed at reducing that part of air pollution resulting from fly ash and cinders emitted by steam locomotives.

Moving swiftly to the forefront in the drive to rid the country of smoke and dirt, these two major industries met to consider the problem. A committee formed by the railroads and representatives of Bituminous Coal Research, Inc., the national research agency of the bituminous-coal industry, reached an agreement calling for an immediate research and development program. BCR expects the results of this program to have national application.

Representatives of these two industrial groups have been working for several months on the preparation of this program. Meetings were held to study methods by which railroads operating steam locomotives in the county can more effectively comply with the provisions of the new county smoke ordinance.

A special committee to be known as the Locomotive Cinder Collector Research and Development Committee, has been formed to supervise the jointly financed program. This eleven-man committee will direct the work that will include the design, construction, and testing of a cinder and fly-ash collection and disposal system suitable for conventional steam locomotives.

Compressibility Charts

A SERIES of compressibility charts, covering the very broad pressure-temperature range usually encountered in engineering practice, have been published in the July, 1949, issue of the Worthington Research Bulletin, by the Worthington Pump and Machinery Corporation of Harrison, N. J. They are especially complete at low values of reduced pressure. Formulas are developed applicable to gases that do not follow the perfect-gas laws, in which compressibility factors shown on the charts may be used for estimating compressor horsepower and limiting throat pressures and weight flows for nozzles.

Mr. Paul Diserens, Fellow ASME, and director of research for development of Worthington Pump and Machinery Corporation, pointed out that approximate methods for estimating energy transformations involved in pressure-volume change for gases, the physical properties of which are only partially known, have often been used, but the methods employed have always seemed awkward and only partially satisfactory. He said that the approach to the problem presented in the Bulletin is believed to be novel and that several years experience in applying the proposed formulas to specific compression problems indicate that they lead to results which satisfy most engineering requirements. The charts have been constructed using one pound pressure, absolute, as a base rather than one atmosphere used by others for similar charts, otherwise they do not differ materially from those already available.

By a rational analysis, the following energy equation for nonperfect gases is derived in the Bulletin

$$E = \frac{k}{k-1}\,\frac{V_1p_1}{r-1}\left[(r^{\frac{k-1}{k}} - 1)(r - f) + \frac{(k-1)(f-1)}{2k-1}(r^{\frac{2k-1}{k}} - 1)\right]$$

where r = ratio of pressures, and f = ratio of compressibility factors.

Then, if $f = 1$, the foregoing equation reduces to the familiar equation for the isentropic compression of a perfect gas

$$E = \frac{k}{k-1} V_1p_1 (r^{\frac{k-1}{k}} - 1)$$

The energy (or horsepower) involved in an isentropic change for a perfect gas is usually available in tabular form or from charts such as those given in most handbooks. The difference between values determined from the foregoing two equations provides a convenient means for converting energy (or horsepower) for a perfect gas to corresponding values for a real gas.

Management School

A UNIQUE management school has been set up at plants of the Westinghouse Electric Corporation, it was announced recently in Pittsburgh, Pa. The school is enrolling supervisors, from foremen to managers, to study the latest principles of successful management at various Westinghouse plants.

Organized by the firm's management-development service, the first course in the school has been conducted for Westinghouse plants at Sharon, Pa.; Cleveland, Ohio; and Springfield, Mass. Experience at these three locations has shown the program to be one practical answer to the long-recognized need for adequately trained supervisory personnel.

The three primary objectives of the management-development service, are as follows:

1 To assure that Westinghouse management, from foreman to manager, has the latest knowledge and the best training possible to efficiently run today's complicated industrial operations.

2 To build the finest spirit of teamwork possible among management people.

3 To develop high-quality supervisors from within the ranks of our employees.

Under the program, the manager of each plant selects the supervisory people who will go to school. The number of trainees is determined by the size and needs of the individual plant.

The curriculum is divided into three phases. The initial one-week course covers human relations in management and how they can affect a man and his work. It also includes such specific subjects as effective speech, leadership principles,

elements of instructing, applied psychology in both individual and group relations, and the wide field of sound labor relations.

The second phase, technical factors of management, includes later courses on job methods, quality control, plant safety, cost control, and wage incentives. Although detailed knowledge of each field is not needed by every supervisor in his everyday work, the courses will acquaint all management people with the company services available to them.

Specific management problems compose the third phase of the program. Periodic discussion meetings to talk over changes in company policies, new legislation affecting the conduct of business, and many other management problems make up the final phase.

Cold-Pressure Welding

A METHOD of welding metals by pressure at room temperature—cold-pressure welding—has been developed by the General Electric Company, Ltd., of England. It is claimed that this process, controlled in the United States by the Koldweld Corporation, New York, N. Y., can be successfully applied to several types of nonferrous metals—aluminum, duralumin, cadmium, lead, copper, nickel, zinc, and silver. However, for the present its most important application probably is for the cold welding of aluminum. On ferrous metals experimental work is now progressing, but is not complete.

The aluminum surfaces to be welded must be entirely free from the film of oxide, which begins to form on aluminum immediately after it is exposed to atmosphere. Although thin by ordinary standards, this film will prevent welding, but it is easily removed by a well-known, simple method.

Once removed, the oxide film reforms comparatively slowly, and satisfactory welds can be made several hours later, provided that the cleaned surface has not meanwhile been contaminated by moisture or grease. Even the contamination caused by handling the material will invariably prevent formation of a satisfactory weld.

In the cold-pressure process of welding, the metal is made to flow away from the welding point as two surfaces of a special plyer-shaped tool are brought together. It is perhaps surprising that the rate of application of the pressure does not appear to affect the strength of the weld, and that good welds can be made with tools giving either a slow squeeze or an impact. However, the shape of the two contacting surfaces is most important.

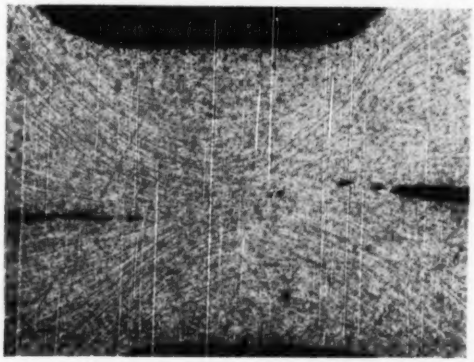


FIG. 6 A MICROSECTION OF A TYPICAL KOLDWELD WELD, SHOWING THE LINES OF FLOW

(Note absence of weld line, a remarkable feature of this type of weld.)

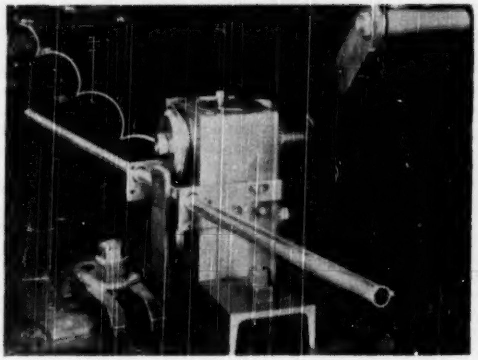


FIG. 7 MACHINE FOR MAKING SEAM WELD; TRIMMED METAL CAN BE SEEN CURLING AWAY.

From the runs so far carried out with suitable die materials, there has been very little evidence of die wear. In many applications, however, it will be possible to counteract the effects of such wear by occasionally resetting the die closure.

Three somewhat different techniques have been evolved—the straight weld, the ring weld, and the continuous seam weld.

The straight weld can be used for box seams, for sealing tube ends, and for other forms of lapped joints which are almost equivalent to butt-welds.

The ring weld can be used for sealing the end of a flanged tube, and several other applications. It may be used for joining a flanged tube to a plate for making hose connections, or two disks may be joined together to form an air-pressure cell. Wheels also may be constructed, by taking advantage of the natural flow of the material, to form the shape.

Among the important applications of the seam weld are for tubemaking and for sheathed cables. A machine has been constructed in which the process of scratch-brushing, final forming, welding and trimming, is carried out continuously and automatically. In addition, a roller welding machine can be used to seal the edges of a folded section while following quite a complicated outline. The free edges of a box-shaped section may also be seamed by rolling in such a machine.

Atomic Powered Aircraft

ATOMIC energy may someday propel supersonic bombers nonstop around the world, Andrew Kalitinsky, Chief Engineer of the NEPA Project, a Division of Fairchild Engine and Airplane Corporation, Oak Ridge, Tenn., declared in an address before the National Conference on Industrial Hydaulics in Chicago, Ill., recently.

He pointed out that atomic power offers fuels such as uranium that would not be consumed nearly so fast as those in chemically fueled airplanes. He named high operating temperatures, heat transfer, and weight of the mass needed to stop radiations as some of the problems encountered.

Mr. Kalitinsky said that developing a nuclear-aircraft power plant will be difficult but there are several basic types of power plants that can be adapted to utilize this power. All are thermal power plants. Examples would be turboprops, turbojets, ramjets, and rockets.

Because chemically fueled planes must be made larger and heavier in order to increase speed and range, there is a performance limit imposed. On the other hand, atomic fuel of almost constant size and weight and high heating value offers attractive possibilities, Mr. Kalitinsky stated.

He said that our present supersonic airplanes run out of fuel in a matter of a few minutes, but with atomic power, they could keep going because the fuel supply would remain nearly constant.

The engine component of the nuclear installation may be expected to weigh about the same as a conventional power plant of the same horsepower and thrust rating, Mr. Kalitinsky reported. Weight of the reactor shielding would be approximately equivalent to the weight of fuel and fuel tanks in large chemically powered aircraft.

Transfer of heat generated in the reactor to the working fluid, protection of the radioactive material against corrosion by the working fluid (or the escape of fission products from the reactor into the working fluid), and the choice of shielding materials, including the consideration of density and resultant decrease of volume, are among development problems cited by the speaker.

The atomic-powered aircraft will be a large airplane, designed to operate at high speeds; and it will have an extremely high landing weight since practically no fuel will be consumed during flight. Crew members will be placed as far as possible from the nuclear reactor to protect them from harmful radiations.

Free-Piston Engine

A NEW type of auto or truck engine, using hot gases to turn a turbine, may be the outgrowth of tests being conducted at Stanford University in California, on a German-developed Junkers "free-piston" Diesel compressor.

This crankless engine, which runs well on low-grade oil, can, in principle, be made in any size from that of an auto engine up to the size of the largest Diesel.

Stanford engineers say that its advantages over other engines are that it is light, almost free of vibration, and is inexpensive to build, operate, and maintain.

The particular engine tested in the Stanford Mechanical Engineering Department, under the direction of Prof. A. L. London, Mem. ASME, was formerly used as an air compressor in a German submarine and was given to Stanford through the courtesy of the U. S. Bureau of Ships to stimulate research and development of free-piston systems on the West Coast.

Professor London said that the design of the engine, which is characterized by extreme mechanical simplicity, makes it suitable for use either as an air compressor or as an all-purpose prime mover.

Tests on the engine confirm German performance claims that it would take 70 cfm of free air and compress it to 3000 psi of compressed air.

As a prime mover, Professor London explained, such an engine would produce hot exhaust gases—roughly at a pressure of 100 psi—and these gases would drive a turbine which in turn would drive a shaft.

Theoretically, the free-piston Diesel-turbine prime mover has a higher thermal efficiency than the modern Diesel.

The vibration-free qualities of the engine are demonstrated by the fact that one can successfully balance a coin on edge on the engine while it is in operation.

The Stanford work, sponsored by the Office of Naval Research, is aimed at analyzing the thermodynamic and dynamic design aspects of both the air compressor and prime-mover types of free-piston systems.

Curiously enough, the engineers point out, the free-piston engine is not new. It was invented some 20 years ago by a Frenchman named Rault de Pescara, who is still carrying on extensive development work in France.

Recent interest in the engine was inspired by both German and French successes in making use of the engine.

The German Junkers system tested at Stanford is a single-cylinder, 40-hp, opposed-piston Diesel operating on a two-stroke cycle, with four steps of air compression. The system is designed to produce compressed air for torpedo launching.

Flow Measurements

IN the solution of flow problems the engineer is frequently confronted with a choice of two types of solutions—an "ideal" solution and an "approximation" solution.

The approximation solution arises from the fact that something less than ideal is frequently acceptable and at lower cost.

The proper choice of solution will depend upon many attending conditions.

In simple ratio or proportioning control, the problem is solved by measuring each component and by applying the two signals to a suitable regulator or controller.

However, when one component is to be proportioned to a sum of two or more components, the solution becomes a bit complicated because the measuring signals are usually nonlinear and cannot be added directly to obtain the desired result.

Practical approximations for summarizing square-function measurements of two flows were discussed by D. T. Gundersen, chief engineer, Askania Regulator Company, Chicago, Ill., at the 1949 ASME Industrial Instruments and Regulators Division–Instrument Society of America Conference in St. Louis, Mo.

Examples of the precise summation of two flows and approximate summation of two flows were cited by Mr. Gundersen in the paper.

In discussing the approximate summation of more than two flows, he said that the method of summation in the ideal case obviously lends itself to extension of any number of flows by adding an additional branch to the summarizer and an additional regulator for each added flow.

The approximation method may theoretically be extended indefinitely, but in simplest form it appears to be limited, possibly to three components, because of physical limitations in adding additional sensing elements to a single regulator.

Although calculations may be straightforward for the approximation method, plotting of resulting data is probably also limited to the summation of three flows.

He pointed out that, in general, the ideal solution will be physically more complicated and initially more expensive, but it does give a unique correct solution. Its range of applicability is limited only by the sensitivity of the regulators. It may be easier to understand and to adjust, because a unique solution is required, and because the variables under control are completely separated. Its long-term costs should be a minimum because errors are at a minimum.

In general, the approximation solution will be physically less complicated and initially less expensive; but it does give an approximate result with limitations as to range of applicability. The process must be better understood in order to apply the approximation within the limitations. The long-term over-all cost may be higher because the solution is an approximation. The solution may be less easy to understand and to adjust because of the absence of a unique result, and less complete separation of the controlled variables. A higher-caliber judgment in supervision and operation may be required if optimum results are to be obtained.

ASME TECHNICAL DIGEST

Substance in Brief of Papers Presented at ASME Meetings

Gas-Turbine Locomotives

A 4000-Hp Gas-Turbine Locomotive for Passenger Service, by W. H. Brecht, Mem. ASME, Charles Kerr, Jr., Mem. ASME, and T. J. Putz, Mem. ASME, Westinghouse Electric Corporation. 1949 ASME Annual Meeting paper No. **49—A-26** (mimeographed).

The Westinghouse Electric Corporation is constructing a 4000-hp gas-turbine locomotive for passenger service. This locomotive is being built for experimental purposes with full realization that an extensive development lies ahead before gas-turbine motive power becomes a commercial product.

The locomotive is being built in one unit, arranged for single-end operation, and will be carried on four 2-axle swivel trucks, giving a B-B-B-B wheel arrangement. All eight axles will be equipped with traction motors, making 100 per cent of the total weight available for adhesion.

The main power supply will be secured from two 2000-hp simple, open-cycle turbine-generator sets, located side by side in the locomotive cab with a center aisle. Steam for train-heating purposes will be provided by two boilers, having a total steam-producing capacity of 5000 lb per hr.

The two gas-turbine-generator units each consist of a compressor, turbine, gear-reduction unit, and generator all mounted on a common bedplate which serves as a lubricating-oil storage and houses the motor-driven auxiliaries and fuel-oil control valves. The units are mounted in the locomotive on a three-point suspension which prevents weaving of the main locomotive frame from being transmitted to the turbine equipment with possibilities of misalignment.

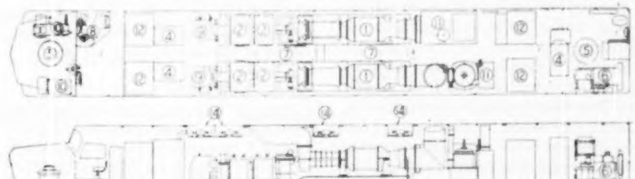
The electric transmission for the gas turbine is essentially the same as for a locomotive powered by Diesel engines or steam turbines.

Westinghouse is building this locomotive to gain experience with the design and operation of gas turbines in railroad service. When completed, it is planned to start operation on runs of relatively short length where the locomotive can be closely followed.

A 4500-Hp Gas-Turbine-Electric Locomotive, by A. H. Morey, Mem. ASME, and R. A. Williamson, General Electric Company, Erie, Pa. 1949 ASME Annual Meeting paper No. **49—A-46** (mimeographed).

The philosophy of handling a large-scale development such as a new form of railroad motive power; how the general specifications and ratings for this locomotive and power plant were determined; and comments on the apparent usefulness of a locomotive having these characteristics, are discussed in this paper.

Analyses made of freight and passenger locomotives in use in this country indicated that approximately 90 per cent



GENERAL ARRANGEMENT OF WESTINGHOUSE GAS-TURBINE LOCOMOTIVE

(1, Power plants; 2, main generators; 3, traction motors; 4, control cabinets; 5, motor blowers; 6, auxiliary Diesel-generator set; 7, batteries; 8, engineman's control station; 9, air compressors; 10, air-brake equipment racks; 11, steam generators; 12, water tanks; 13, fuel tanks; 14, cab ventilating fans.)

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of the locomotives handled freight, and of this 90 per cent, about 75 per cent were in the 4000 to 5000-hp range, having approximately 500,000 lb on drivers.

The following approximate specifications for a gas-turbine-powered locomotive were therefore set up:

1 Single-unit design for freight service with possible conversion to passenger service.

2 No idle axles.

3 As high a weight per axle as consistent with good maintenance to provide maximum tractive effort.

4 Clearances permitting widest possible use without making structural changes.

5 Cruising range comparable with modern Diesel-electric practice.

6 Electric drive.

7 Rating of 4500 hp on the conventional basis of input to generator for traction.

8 Design for highest possible availability and lowest possible operating costs in all respects.

To meet this general specification, specific requirements for a power plant burning commercial-grade fuel oil were established.

As a result of these general specifications, two years of design and manufacturing, and more than a year of test under a wide variety of conditions, a single cab, double-end, B-B-B-B gas-turbine locomotive weighing 506,000 lb evolved. Its manipulation as a locomotive is essentially like that of a Diesel-electric. The power-plant control is entirely automatic and requires little or no attention en route. Power-plant starting is not quite "push-button" starting but approaches it rather closely. In about three minutes the power plant can be started and brought up to locomotive operating conditions, provided that the fuel stored in the locomotive is at an operating temperature. Stand-by heating equipment adequate to maintain this temperature is provided.

Locomotive control permits full utilization of available power, up to maximum capacity of the drive.

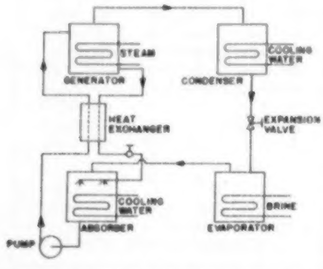
Absorption Refrigeration

A Modern Development in Absorption Refrigeration Using Water Vapor, by A. A. Berestneff, Carrier Corporation, Syracuse, N. Y. 1949 ASME Annual Meeting paper No. **49—A-89** (mimeographed).

An absorption refrigeration machine for chilled water service, economical in first and operating cost, is described.

The principle of absorption refrigeration is based on the affinity existing between certain substances which results in absorbing of one of the substances by the other. A good example is a combination of salt and water, the latter being readily absorbed by salt in the liquid or vapor state. This affinity is measured by the depression of the vapor pressure of water which is the more pronounced the more salt is added to water to form a solution.

The Carrier absorption machine employs a solution of lithium bromide salt in water—the latter being used as a refrigerant. The boiling point of the salt, which is a solid at ordinary temperatures, is so high that it behaves as a nonvolatile substance. Therefore there is no vaporization of the absorbent in the generator of such a system and no carry-over of absorbent vapor to the condenser. Since there is no need for additional equipment to keep the absorbent away from the refrigerating part of the cycle, the machine remains very simple. At the same time its efficiency is high since no heat is lost for unnecessary re-evaporation of the absorbent. High efficiency is also assured by the high latent heat of water which, in fact, is the highest value known for any substance.



SIMPLE REFRIGERATION ABSORPTION CYCLE

Since the new machine was designed for chilled-water application, it was logical to make it a flash system, that is, to cool the water by flashing a small part of it while it passes through the evaporator and then to use it as a cooling medium in the coil. This eliminates the heat-transfer surface which otherwise would be needed for producing the chilled water as in the conventional coolers of compression machines, thus reducing the first cost. It also saves the temperature differential needed for heat transfer through the surface, and permits working at a higher suction temperature, which increases capacity and efficiency. In addition, the absorber and evaporator are combined into one common shell (low side) and the condenser and generator into another one (high side). As a result of all these design features, the new machinery is inherently simple, compact, reasonable in first cost, and high in efficiency.

Control Systems

Some Basic Studies in Proportional Control, by C. E. Mason, Mem. ASME, Bristol Company, Waterbury, Conn., and V. Paschkis, Mem. ASME, Columbia University, New York, N. Y. 1949 ASME Annual Meeting paper No. **49—A-80** (mimeographed).

The Special Research Committee on Automatic Regulator Theory of ASME started investigations in the field of proportional control, and the project which is covered in this paper deals exclusively with proportional control. The purpose of the investigation was to examine the possibility of utilizing the Heat and Mass Flow Analyzer for accurate quantitative analysis of recovery transients in control problems. The selection of this problem as a first step in the long-range program was prompted by two considerations: First, proportional control principles are a basic element for all modes of control; and second, because it seemed easier to operate the Heat and Mass Flow Analyzer according to laws of other modes of control.

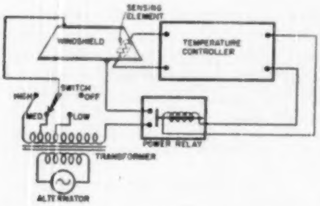
Two four-capacitance continuous dead-end circuits of different degrees of difficulty of control were selected.

The recovery transient of the more difficult one was calculated mathematically; based on a comparison of the mathematical curve with that found on the analyzer it is believed that the latter can be used for an accurate quantitative analysis of control problems.

The experiments verifying this assumption, as well as a comparison of damping ratios and controlling sensitivities of the two circuits, are given.

Automatic Temperature Control for Electrically-Heated Windshields, by Harry R. Karp, Bendix Aviation Corporation, Teterboro, N. J. 1949 ASME Annual Meeting paper No. **49-A-107** (mimeographed).

A recently developed method for de-icing windshields has been met with favor by many departments in the National Military Establishment and by the aircraft manufacturers and airlines. This paper describes the over-all system, in general, and the control functions in particular. Current problems and re-



REPRESENTATIVE WINDSHIELD TEMPERATURE-CONTROL SYSTEM

quirements in the deicing and temperature control of windshields by electrical means are discussed.

Essentially the windshield is sandwich-type safety glass. The outer surfaces are of glass and the inner material, or interlayers, are of transparent plastic. The windshield is unique in that a coating of transparent conductive material is placed between the plastic and the outboard glass. Bus strips running parallel along two edges provide means for applying power to the windows. The resistance between terminals is about 110 ohms per sq ft, and is a resistive-type load having a negligible temperature coefficient of resistance. Voltage applied to the terminals generates heat where it is needed, that is, over the entire surface of the windshield. This method has several advantages over other systems in that heat is produced efficiently on the required surface and with minimum optical distortion.

This windshield temperature controller and the temperature-sensing elements is said to represent a satisfactory solution to various problems of controlling heated windshields.

Plastics Testing

Long-Time Tension and Creep Tests of Plastics, by C. E. Staff, H. M. Quackenbos, Jr., Jun. ASME, and J. M. Hill, Jun. ASME, Bakelite Corporation, Bloomfield, N. J. 1949 ASME Annual Meeting paper No. **49—A-61** (mimeographed).

Creep tests for plastics have usually been justified in the past for two reasons. First, the results were thought to be connected with fundamental physical properties. In the present paper this aspect will be neglected although the physical chemist is not excluded from making his own interpretation. The second reason is that plastics were on the threshold of light structural uses. Good creep data, of course, will always find use in structural design but this study was pursued mainly with the conviction that the results relate to many present applications. It is not generally recognized that two practical aspects of creep, namely, sustained stress and continuing deformation, affect so many common molded parts. Examples are as follows: Fan blades resisting centrifugal stresses, material around metal inserts under stresses that have arisen from differential contraction, parts under stress from differential water absorption, objects bearing direct load (e.g., coat hangers and bottle caps screwed tight), and moldings shrinking under the influence of high ambient temperature.

It is pointed out that thermosetting and thermoplastic materials have been maintained under constant load at 25 C and 75 C for periods ranging from 1000 to 14,500 hr. Creep was measured with electric strain gages and, from its course, an estimate has been made of the maximum stresses that can be sustained for five years by the thermosetting materials. Both creep and crazing govern the maximum stresses for the thermoplastics and these have been estimated for one year. An examination has been made of the accuracy and precision of the electric strain gage in measurements of creep. It is believed that the results are not confined to use in potential structural applications but have their greatest value in many problems of today.

Applied Mechanics

A Method for Determining Mode Shapes and Frequencies Above the Fundamental by Matrix Iteration, by H. I. Flomenhoft, Bureau of Aeronautics, Department of the Navy, Washington, D. C. 1949 ASME Annual Meeting paper No. **49—A-21** (in type; to be published in the *Journal of Applied Mechanics*).

Recently, an increasing use has been made of the matrix-iteration method for determining mode shapes and frequencies, particularly with regard to dynamic problems in aircraft design. Its particular advantage is the relative ease with which it handles complex discontinuous structures whose elastic properties can be defined adequately only in terms of influence coefficients. The disadvantage of tedious calculations has been alleviated greatly by an "acceleration method" for convergence which has been described by Isakson. The predominant disadvantage to matrix iteration, however, has been the difficulty in obtaining mode shapes and frequencies higher than the fundamental. The purpose of this paper is to establish a technique for accomplishing this in a manner that is practical for use in industry, as proved by its successful application to many problems of this type in the Aero-Elastic and Structures Research Laboratory at the Massachusetts Institute of Technology. This is accomplished by applying a device worked out by L. A. Pipes, and extending it to the general case, at the same time organizing the computations in tabular form. Only a basic knowledge of matrix notation and dynamic systems is necessary to understand this development, and this can be obtained easily by a review of von Kármán and Biot's work on this subject.

Beam Vibrations With Time-Dependent Boundary Conditions, by R. D. Mindlin, Mem. ASME, Columbia University, New York, N. Y., and Consultant, Bell Telephone Laboratories, Inc., Murray Hill, N. J., and L. E. Goodman, Columbia University, New York, N. Y. 1949 ASME Annual Meeting paper No. **49—A-19** (in type; to be published in the *Journal of Applied Mechanics*).

A procedure is described for extending the method of separation of variables to the solution of beam-vibration problems with time-dependent boundary conditions. The procedure is applicable to a wide variety of time-dependent boundary-value problems in systems governed by linear partial differential equations.

Thermoelastic Stress Around a Cylindrical Inclusion of Elliptic Cross Section, by Raymond D. Mindlin, Mem. ASME, Columbia University, New York, N. Y., and Consultant, Bell Telephone Laboratories, Murray Hill, N. J., and Hilda L. Cooper, Bell Telephone Laboratories, Murray Hill, N. J. 1949 ASME Annual Meeting paper No. **49—A-20** (in type; to be published in the *Journal of Applied Mechanics*).

The two-dimensional equations of thermoelasticity are solved for the case of a uniform temperature change of an infinite medium containing a cylindrical inclusion of eliptic cross section. The problem is treated as one of plane strain in elliptic co-ordinates, and the solution is given in closed form. Formulas and curves are given for the maximum values of various components of stress at the interface between the inclusion and the surrounding medium.

An Investigation of Ejector Design by Analysis and Experiment, by J. H. Keenan, Mem. ASME, E. P. Neumann, Jun. ASME, and F. Lustwerk, Jun. ASME, Massachusetts Institute of Technology, Cambridge, Mass. 1949 ASME Annual Meeting paper No. **49—A-25** (in type; to be published in the *Journal of Applied Mechanics*).

A one-dimensional method of analysis of jet pumps or ejectors is presented

The analysis considers mixing of the primary and secondary streams at constant pressure, and mixing of the streams at constant area. For the analytical conditions considered, better performance can be obtained when constant-pressure mixing is employed. A comparison between experimental and analytical results shows good agreement over a broad range of variables. Some experimental data on the length of tube required for mixing of the two streams are presented. A method of jet-pump design is given.

The Calendering of Plastic Materials, by R. E. Gaskell, Iowa State College, Ames, Iowa. 1949 ASME Annual Meeting paper No. **49—A-34** (in type; to be published in the *Journal of Applied Mechanics*.)

Many industries, notably the paper, linoleum, rubber, and steel industries, use a rolling process to form or otherwise treat sheets of these various materials. To most engineers, perhaps, the term "rolling" brings to mind only the rolling of steel or aluminum—solids with definite yield points. Several mathematical studies of the rolling of such materials have already been made. In those studies, any shear stress beyond the yield stress is neglected. The plastic materials handled by other industries, however, do not often have the definite yield point of steel, or, after yielding takes place, they may behave more like liquids of very high and usually variable viscosity. Shear stress beyond the yield point, due to viscosity, cannot therefore be neglected. Consequently, a different approach must be made if a mathematical description of the process is to be formulated. Such an approach is made in this paper.

Gas-Turbine Power

Closed-Cycle Gas Turbine—Escher Wyss-AK Development, 1945–1950, by Curt Keller, Mem. ASME, Escher Wyss, Ltd., Zurich, Switzerland. 1949 ASME Annual Meeting paper No. **49—A-35** (in type; to be published in Trans. ASME).

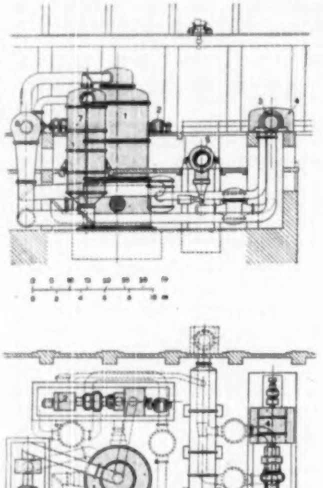
In 1945 Ackeret and the author made the first presentation in the United States of the basic theory and results of tests on a 2000-kw closed-cycle gas turbine, which had been pioneered by the author's company. Since then the development has progressed rapidly and larger industrial installations have been made. Compressed high-temperature air and other gases, used in closed-cycle turbines, have led to new designs of components and plant layouts.

As the 2000-kw test plant is in many respects the basis for present designs, a review of its 10-year record is given. It is still in good condition and ready for further work.

At present, three closed-cycle plants are under erection, two for power plants and one for waste-heat use in a gas works.

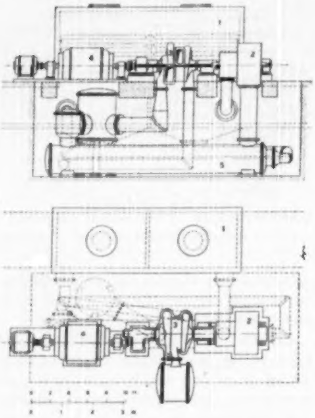
Electricite de France has ordered a 12,500-kw oil-fired set for the St. Denis power station in Paris. This plant will start operation early in 1950. Its regulation system enables it to follow load fluctuations independently of the network. This system works on the principle tried out in the test plant, using cold-storage air for changing pressure level in the circuit. Allowable generator speed variations for different load fluctuations are about the same as in corresponding steam plants. A heat rate of about 10,000 Btu per kwhr is expected. At full load, working data are: Inlet of high-pressure turbine, 750 psia, 665 C; inlet of low-pressure turbine (reheat), 255 psia, 675 C; back pressure, 65 psia.

Another 12,500-kw unit is being built by John Brown & Co., for the Carolina Port power station (Dundee) of the North of Scotland Hydro Electric Board. This forms part of the hydro scheme under development in Scotland, and it will operate as a base-load or stand-by plant depending on future needs. Regulation will be effected by pressure-level variation, but, as unforeseen load fluctuations will not occur in the same degree as at Paris, the system is somewhat simpler. No compressed-air accumulators are necessary; auxiliary piston compressors introduce or withdraw air from the circuit. These take care of any eventual leakage also. Main circuit data for Paris and Dundee sets are the same.



GENERAL LAYOUT OF PARIS INSTALLATION

(1, Air heater; 2, high-pressure turbine-compressor group; 3, low-pressure turbine with low-pressure compressor; 4, generator; 5, heat recuperator; 6, charging set with return gas fan; 7, combustion-air preheater.)



LAYOUT FOR 1000-KW CLOSED-CYCLE PLANT FOR WASTE-HEAT RECOVERY

(1, Waste-gas air heater; 2, turbine; 3, compressor; 4, generator; 5, heat exchanger.)

The waste-heat utilization unit, of about 700 kw, for a gas works is being built by John Brown and Company, together with Spencer Bonecourt, Ltd., London.

Studies have shown that a closed-cycle plant offers an economical and reliable way of utilizing heat available in waste gases such as occur in gas works, carbonizing plants, and the steel, chemical, and oil industries. Waste heat is often available at high temperatures (600–900 C) and low pressures. Heat must be supplied to the working medium of any turbine cycle in an indirect way. Up to now, waste heat was used mostly in boilers to produce steam for engines or turbines. As high-temperature service is not suitable for them and efficiencies of small sets are low, it usually does not pay to produce electrical energy.

The gas turbine changes this picture entirely. In the case just mentioned, one gets about double the electric output when choosing a closed air cycle instead

of steam. The air heater can be built very simply as a counterflow tubular heat exchanger. Waste gases with a temperature of 800 C can easily heat working air to 600 C. The exhaust gases of the air heater can still be used to produce process steam.

Fly-Ash Disposal

THE following four papers are contained under one cover and are available at the single-copy price; 25 cents to members, 50 cents to nonmembers.

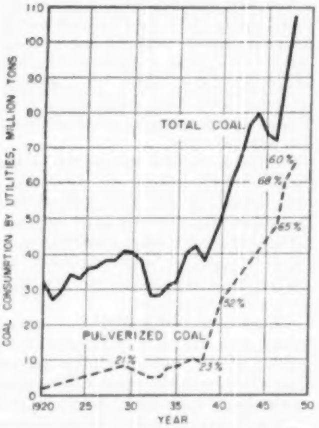
The Present and Future Magnitude of the Pulverized-Coal Fly-Ash Disposal Problem, by Henry S. Walker, Mem. ASME, The Detroit Edison Company, Detroit, Mich. 1949 ASME Annual Meeting paper No. **49—A-79** (mimeographed).

This paper was prepared as a contribution to a Symposium sponsored by The American Society of Mechanical Engineers on the subject of what has been done, what is being done, and what should be done about the fly-ash-disposal problem.

Some historical information on the fly-ash disposal problem and some pertinent data on the properties of fly ash are presented.

It is indicated that except for a small portion, the collected ash remains a nuisance for the operating company to dispose of without much aid from sale and thus without revenue as opposed to the profitable disposal of cinders. While in some instances, filled-in land may have an increased value, it is believed that this increment is small as compared with cinder revenue and may not even offset in many cases the cost of the dumping operation.

Attempts have been made by only a few operating companies over a period of years to provide a satisfactory economic outlet for the disposal of some, if not all, of the available pulverized-coal fly ash collected. The disposal of fly ash is largely an industry-wide problem and is still unsolved. With the costs as presented, it is hoped that a more concerted effort will be made by more companies or agencies. The problem is one growing in size and of course in cost.



GROWTH OF PULVERIZED-COAL CONSUMPTION BY UTILITIES

Use of Fly Ash in Concrete, by Walter Handy, Combustion By-Products Company, Chicago, Ill. 1949 ASME Annual Meeting paper No. **49—A-81** (mimeographed).

The history of the use of fly ash in concrete started in Italy about two thousand years ago. The material the Italians used with lime to make their masonry was volcanic ash activated by nature and called "pozzuolana." Many years ago the fly ashes from several electric generating plants were found to have the same property as Italian pozzuolana. In the last twenty years many concrete technicians both in the States and foreign countries have studied the value of fly ash as a pozzuolanic cement in concrete.

Many natural pozzuolans including Italian Pozzuolana have been tried with present-day Portland cements. In nearly all tests fly ash has been found equal to, and in some tests, superior to the natural pozzuolanic cements.

Major research on this problem is being carried on by the Public Roads Administration, Bureau of Reclamation, Army Engineers, California, Washington, Nebraska, Kansas, and Iowa Highway Commissions. Fly ash is being used extensively in these programs.

For example, the Kansas Highway Commission completed its first test section of paving containing fly ash this summer.

Fly-ash concrete is being used by many power companies in their new construction.

The Bureau of Reclamation is using Chicago fly ash in Hungry Horse Dam in Montana. This structure will be the fourth largest dam in the world.

The Use of Fly Ash in the Bitumastic Road Industry, by C. M. Weinheimer, The Detroit Edison Company, Detroit, Mich. 1949 ASME Annual Meeting paper No. **49—A-82** (mimeographed).

Early work done by The Detroit Edison Company revealed that the bitumastic road industry offered definite opportunities for the disposal, in sizable quantities, of fly ash as a mineral filler. This field seemed to have promise because the tonnage required was fairly large and a low-cost finely divided material was necessary. In 1939 this Company's fly ash was first approved as a mineral filler for bitumastic road construction. At this time the Department of Public Works of the City of Detroit accepted a bid that proposed to furnish fly ash in conformance with their specification for a mineral filler. Since then both the number of users and the tonnage used in this field have been in ever-increasing numbers.

Trinidad asphalt has been recognized over a long period of time as an excellent material. The chemical composition of the natural filler found in this asphalt does not differ materially from this company's fly ash.

Also, fly ash is hydrophobic, that is, it sheds water readily, which reduces the tendency of moisture to strip the asphalt from the filler. It has good void-filling capacity and meets the requirements of mineral-filler specifications as to particle-size distribution and moisture content. It is of a nonsilicotic nature. The carbon content falls within the range of values that result in the highest stability values for the finished asphalt.

Some New Developments in the Use of Fly Ash, by M. C. Randall, Mem. ASME, Philadelphia Electric Company, Philadelphia, Pa. 1949 ASME Annual Meeting paper No. **49—A-83** (mimeographed).

This final paper describes four other fly-ash applications which give promise of absorbing an appreciable quantity of by-product ash. These are as follows: Insulating cements, building brick, soil-stabilization compound, and fly ash and the foundry industry.

The material referred to in this paper is formed in pulverized-fuel burning operations only and is collected either electrostatically or by means of mechanical dust collectors.

Based on research which had revealed the pozzuolanic activity of fly ash, particularly where combined with Portland cement, together with the known characteristics of mineral wool, bentonite, and other materials, an insulating cement was compounded.

It has been found that an excellent brick can be produced utilizing fly ash and boiler slag. The brick thus produced compares most favorably with the standard shale brick, both in quality and appearance; it can be produced in a

standard brick machine and processed in the same manner as the shale brick.

This idea of using fly ash for soil stabilization was developed by the Corson laboratory. One particular composition "Cor Crete," a mixture of limestone screenings, fly ash, and a small amount of hydrated lime, was used directly as a base course for supporting a concrete pavement and as a cementatious fill to replace the customary limestone screenings normally used as the base course for bituminous concrete pavement.

In the foundry trade one company uses two parts of fly ash to twenty parts of sand as a lubricant in the conglomerated mass of sand, phenol, and other resinous binders when blowing cores to prevent sticking when the core is removed from the mold. This represents a limited demand for fly ash in the nonferrous industry. However, in the steel foundries fly ash is being used to a limited extent to provide hot strength for core and molding sand, as a replacement for silica flour.

Fluid Meters

Calibrations of Six Beth-Flow Meters at Alden Hydraulic Laboratory, Worcester Polytechnic Institute, by L. J. Hooper, Mem. ASME, Worcester Polytechnic Institute, Worcester, Mass. 1949 ASME Annual Meeting paper No. **49—A-38** (mimeographed).

Six Beth-Flow tubes were calibrated by means of a volumetric tank at the Alden Hydraulic Laboratory to determine their suitability as flowmetering elements. Four of the six meters tested had practically the same coefficients with flow in either direction. The flow coefficients were constant above a Reynolds number of 100,000 to approximately 800,000. Further tests are necessary to determine manufacturing tolerances and the effects of disturbed flow due to various types of piping arrangements.

The purpose in calibrating these six Beth-Flow meters was to determine their operating characteristics as a preliminary survey of the usefulness of this type of meter.

Determination of ASME Nozzle Coefficients for Variable Nozzle External Dimensions, by R. G. Folsom, Mem. ASME, University of California, Berkeley, Calif. 1949 ASME Annual Meeting paper No. **49—A-110** (mimeographed).

The internal geometrical configuration and pressure-tap locations for long-radius (ASME) flow nozzles are specified in reports of the ASME Special Research Committee on Fluid Meters. Nozzle discharge coefficients are available for several standard pressure-tap locations. Since the nozzle external dimensions have not been specified, the change in discharge coefficient with different widths of the annulus or clearance between the outside contour of a nozzle and the pipe wall are unknown. The experimental investigations reported in this paper are part of a study to determine the preferable location for the outlet pressure tap to be used with the standard long-radius flow nozzles.

Four 8-in. pipe nozzles with approximate throat diameters of $7^1/_8$, $6^1/_8$, $5^3/_8$, and $6^1/_{16}$ in. were tested.

The test station consisted of 60 diameters of straight upstream pipe from a header to the test flange followed by 30 diameters of straight pipe to a 90-deg elbow. Centrifugal pumps driven by induction motors discharged into the header. A downstream control valve and about 20 diameters of pipe discharging one foot above the elevation of the test section completed the circuit.

It was found that the discharge coefficients for standard ASME long-radius nozzles are almost independent of the clearance in the annulus between the pipe wall and the nozzle external diameter at all pressure-tap locations between the holding flange and the end of the nozzle. At pressure-tap points downstream from the end, appreciable changes in the coefficient with clearance exist with the larger differences corresponding to the smaller diameter ratios.

The tabular and graphical results are expressed in terms of per cent of the differential pressure across the corner taps. The maximum difference in heads (pressure at downstream corner tap minus pressure at given downstream tap) at a given downstream tap between the nozzle with reduced clearance in the annulus and the normal nozzle (as supplied) was $1^1/_2$ per cent for the range of the conditions tested in this investigation.

Heat Transfer

Heat Transfer From an Air Jet to a Plane Plate With Entrainment of Water Vapor From the Environment, by Max Jakob, Mem. ASME, R. L. Rose, Jun. ASME, and Maurice Spielman, Jun. ASME, Illinois Institute of Technology, Chicago, Ill. 1949 ASME Annual Meeting paper No. **49—A-16** (in type; to be published in Trans. ASME).

Ice formation on the inside surface of aircraft windshields had become a serious problem with the introduction of high-altitude pressurized-cabin bombers. One of the techniques available for preventing ice formation is that of blowing a jet of heated air over the inside windshield surface. No basic design information, however, was available.

This paper presents some experimental results, obtained by discharging hot air from a continuous slot parallel to a plane surface. A method for predicting the distribution of surface temperature, relations for the temperature and vapor pressure in the jet, a common correlation relating heat transfer and mass transfer, considering also the entrainment of environment air by the jet, and a numerical example are given.

The apparatus employed simulates a plane windshield by a model which is heated by a jet of hot air blown over one surface and cooled on the other side by a stream of water. Filtered air, having passed through a refrigerating dehumidifier, enters a blower. Steam can be added to the laboratory air through perforated pipes, to increase the humidity difference between the jet and environment air. From the blower the air passes through a duct, with electric heaters and baffles, to a slot from which it is discharged over the test plate. Duct air temperatures and static pressure were read from three thermocouples and a pressure tap ahead of the slot.

A total of 19 tests are reported in the paper.

Heat Transfer to a Fluid Flowing Turbulently Between Parallel Walls With Asymmetric Wall Temperatures, by R. A. Seban, Jun. ASME, University of California, Berkeley, Calif. 1949 ASME Annual Meeting paper No. **49—A-18** (in type; to be published in Trans. ASME).

The case of heat transfer to an incompressible fluid flowing turbulently between parallel walls has been considered for the case of arbitrary uniform wall-temperature values. A technique of calculating the heat-transfer coefficients and the temperature distribution has been indicated.

Variations in the magnitude of the heat-transfer coefficient due to the relative values of the wall temperatures have been shown to reside in variation of the difference between wall and mean fluid temperatures. Such variations are shown to be substantial only for fluids of low Prandtl number.

Presently available data are not sufficiently extensive to establish the accuracy of the solution for the general case. For the case of equal wall temperatures, the solution can be shown to coincide with existing solutions for the case of equal wall temperatures, and these solutions are in accord with experimental

data for the flow of air in ducts of large aspect ratio.

The extension of these concepts to the case of a fluid flowing turbulently in an annulus depends upon the radius of curvature involved. It is complicated by the dissimilarity of the two adiabatic wall solutions necessary to a general solution, and the adiabatic wall solutions are in turn complicated by the inequality of the skin-friction coefficients on the inner and outer cylindrical surfaces.

Heat Transfer to Superheated Steam at High Pressures, by W. H. McAdams, Mem. ASME, Massachusetts Institute of Technology, Cambridge, Mass., W. E. Kennel, Standard Oil Company of Indiana, Whiting, Ind., and J. N. Addoms, Massachusetts Institute of Technology, Cambridge, Mass. 1949 ASME Annual Meeting paper No. **49—A-32** (in type; to be published in Trans. ASME).

The object of this investigation was to determine local or point coefficients of heat transfer from metal to superheated steam at pressures up to 3500 psia, for a heater having an outside diameter of 0.25 in., concentrically located in an unheated vertical jacket having an inside diameter of 0.382 in. Mass velocities in the annulus were to be restricted to the range from 55,000 to 165,000 lb per hr per sq ft of cross section. Heater temperatures were to be as high as possible.

Local coefficients of heat transfer from a 12.3-in-length of 0.252-in. tubing to steam flowing upward in a vertical annulus were measured for pressures from 115 to 3500 psia, for temperatures from 430 to 1000 F, and for temperature differences from 100 to 620 F. All results are correlated in terms of the local Nusselt number, the Reynolds number, and Prandtl number, and the geometrical ratio L/D_e, with the physical properties evaluated at the film temperature.

Heat Transfer and Flow-Friction Characteristics of Some Compact Heat-Exchanger Surfaces. Part I—Test System and Procedure; Part II—Design Data for Thirteen Surfaces, by W. M. Kays, Jun. ASME, and A. L. London, Mem. ASME, Stanford University, Stanford, Calif. 1949 ASME Annual Meeting paper No. 49—A-95 (mimeographed).

TEST SYSTEM AND PROCEDURE

A test apparatus and testing technique which is being currently employed for the accurate determination of the basic heat-transfer and flow-friction characteristics of compact heat-exchanger surfaces is described. The design of this test system was based on experience gained from a similar system at the U. S. N. Engineering Experiment Station, Annapolis, Md.

The principal element of the test apparatus is an induced controllable-flow air duct with a rectangular test section, $8^3/_8$ in. $\times$ $9^3/_4$ in. The exchanger surface under investigation is made into test cores which are placed in the test section. Air-side instrumentation is provided for metering the air, measuring the change in air temperature through the core, and measuring the air pressure drop.

A steam system is provided to supply slightly superheated steam to the test core and instrumentation is provided so that the energy loss of the condensing steam may be measured and compared to the separately determined energy gain of the air. This energy balance provides a continuous partial check on the accuracy of the instrumentation.

The experience in the design and operation of this system has indicated that accurate results are obtainable only if the following points are given special attention: (1) A method must be provided for controlling the air flow to a uniform velocity distribution at the entrance to the test core; (2) air temperatures must be measured at a large number of points over the flow cross section on the downstream side of the test core; (3) all air-temperature measuring devices must have radiation shields and the duct walls must be insulated to avoid radiation errors; (4) small temperature-measurement inaccuracies will result in excessive error in the heat-transfer results unless the test cores are designed to operate in a limited range; (5) provision must be made for the accurate control of steam pressure and steam inlet state; (6) care must be taken to locate the air pressure taps on the downstream side of the test core at a point allowing the maximum pressure recovery; (7) the accuracy of the friction-factor tests should be considered in the light of the effect of entrance and exit flow losses; and (8) a continuous check on the temperature and flow instruments should be provided in the testing procedure, as by direct calibration and energy-balance comparisons.

DESIGN DATA FOR THIRTEEN SURFACES

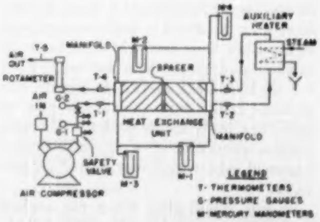
New developments in prime mover and process equipment have created a greater need for compact heat-transfer surfaces. This part presents basic heat-transfer and flow-friction design data for 13 such surfaces which may be described generally as the plate-fin-type and finned-flat-tube type. These surfaces may prove to be useful in the gas turbine and other applications where careful design will pay a premium in compactness and performance. In addition to the use of the conventional nondimensional correlations the various surfaces are compared on heat-transfer coefficient versus flow-friction horsepower basis.

It is concluded that (1) the data are of sufficient accuracy for preliminary design calculations for new applications of these surfaces; (2) no optimum surface can be specified from these results alone; (3) the nondimensional correlation between the variations of a type of surface are sufficiently good so as to suggest that the results reported may be interpolated and extrapolated to some extent to other modifications; (4) plate-fin surfaces exhibit both tubelike and platelike flow characteristics depending to some extent on the length of hydraulic diameter ratio of the surface; (5) in general, the heat-transfer characteristics are more descriptive of the boundary-layer flow than the fanning-friction factor; (6) since the form drag effects are largely parasitic, in that they do not contribute to the heat transfer, as more information is accumulated superior surfaces from a heat-transfer friction-power point of view may result; and (7) the surfaces reported, with one exception, are now being used only for relatively low-temperature uses.

A Perforated-Plate Heat Exchanger, by H. O. McMahon, R. J. Bowen, and G. A. Bleyle, Jr., Arthur D. Little, Inc., Cambridge, Mass. 1949 ASME Annual Meeting paper No. **49—A-92** (in type; to be published in Trans. ASME).

Performance data of heat transfer and flow resistance are presented for the continuous heating of air in several experimental variations of a new type of aluminum perforated-plate heat exchanger. These exchangers consisted of sections built up by stacking multiple units of a perforated aluminum plate and a neoprene gasket, to form parallel channels perpendicular to the plate faces. Tests were conducted by causing air to flow countercurrently through these passages.

For this investigation, the following are indicated:



EXPERIMENTAL INSTALLATION USED IN PERFORATED-PLATE HEAT-EXCHANGER TESTS

1 In the range of flow rates, $800 < N_{RE} < 4300$, the average-heat-transfer coefficient, based on the area inside of the holes, is a simple power function of N_{RE}, exponent variations with increasing gasket thickness of from 1.14 to 0.88 having been observed.

2 Heat-transfer and flow-resistance phenomena can be explained on the basis of a two-function theory. The gasket thickness is considered to cause turbulence by the interruption of the laminar-flow layers at the walls of the tube portions, as well as by making available heat-transfer area on the faces of the plates.

3 The influence on fluid friction and heat transfer of increasing hole diameter is to increase them. The influence of increasing plate thickness is to increase fluid friction and to decrease heat transfer somewhat.

4 In the range of flow rates studied, for a given gasket thickness, the fluid-friction factor is independent of the mass velocity.

5 Pressure-drop efficiency factors for these exchangers are substantially independent of mass flow rate. In general, the influence of an increasing gasket thickness was, first, to increase and then to decrease this efficiency factor. Increase of hole diameter or plate thickness lowered the value of the factor.

It can be stated that this type of unit possesses attractive operational characteristics for large-scale gas-to-gas heat exchange. At the present time full-scale commercial units are being constructed in connection with a special assignment in the field of liquid-oxygen production.

Pressure Drop and Convective Heat Transfer With Surface Boiling at High Heat Flux: Data for Aniline and N-Butyl Alcohol, by Frank Kreith, Jun. ASME, and Martin Summerfield, Mem. ASME, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, Calif. 1949 ASME Annual Meeting paper No. 49—A-94 (mimeographed).

Heat-transfer coefficients to commercial-grade aniline and n-butyl alcohol have been measured at high rates of heat flux. Data have been obtained for both of the liquids in the heat flux range from 0.3 to 3 Btu per sq in. sec and in the pressure range from 30 to 400 psia at velocities from 20 to 40 fps. The test section consisted of a $^1/_8$-in-ID stainless-steel tube which was heated electrically.

It was found that when the surface temperature exceeds either the bubble point (as in the case of aniline which contained 4 per cent of water) or the boiling point (as in the case of n-butyl alcohol), the bulk temperature and the heat flux can be increased and the velocity reduced without appreciable increases in the surface-to-liquid interface temperature. At high heat-flux rates it was possible to obtain heat-transfer coefficients up to 4 times greater than with pure forced convection by reducing the pressure and thus cooling the tube in the surface bubble regime or the surface boiling regime.

In the pure forced-convection regime, heat-transfer coefficients were from 10 to 25 per cent higher than would be predicted by the conventional Sieder and Tate equation. However, the data could be correlated by an equation similar to the Sieder and Tate equation with slightly different coefficients. Unfortunately, the thermal conductivities of the liquids are not known to be reliable and therefore the results should be re-examined after this property has been measured accurately.

In the test program with the n-butyl alcohol, data were obtained on the frictional pressure loss of the coolant liquid in the test section. It was found that the frictional pressure loss decreases (for a given flow rate of coolant liquid) with increase in heat flux. This decrease continues until boiling begins adjacent to the heat-transfer surface. After surface boiling has begun, then the pressure loss increases with any increase in heat flux. Even in the surface boiling regime the pressure loss with heat transfer was less than the isothermal pressure loss for the same mass flow rate.

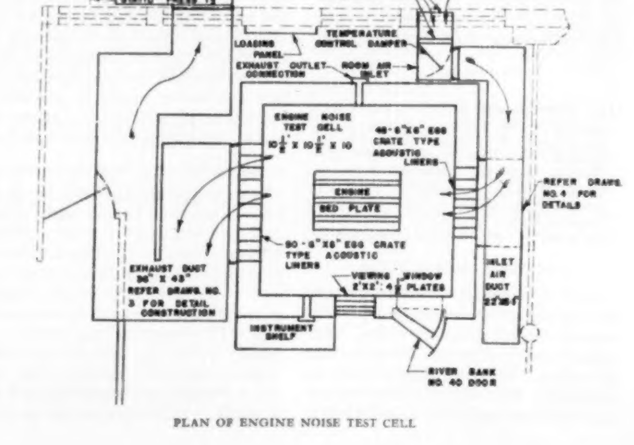
Engine Noise Reduction

Reduction of Noise of Engines, by W. P. Green, Mem. ASME, Illinois Institute of Technology, Chicago, Ill. 1949 ASME Annual Meeting paper No. 49—A-27 (mimeographed).

Recognizing the increased interest in quieter engines the Illinois Institute of Technology has been carrying on research in noise reduction of engines and engine installations for the past three years under its Graduate School and the Armour Research Foundation. A high degree of silencing has been achieved on small two-stroke-cycle engines using a specially constructed engine noise test cell. This paper discusses the fundamental principles used in reducing engine noise and illustrates the application of these principles to some of the problems encountered in carrying out a silencing program.

In noise-reduction work the loudest component of noise is usually identified by ear or by the use of sound instruments. The next step is to identify the surface radiating the noise component to the air, and the source of the energy. Finally, the way in which the sound energy is transmitted from the source to the air (the "coupling" or "energy path") is noted. Silencing can then be undertaken.

In carrying out research on the reduction of noise in lightweight high-speed engines for the Power Branch, Squier



PLAN OF ENGINE NOISE TEST CELL

Signal Laboratory, of the U. S. Army Signal Corps, an engine noise test cell was constructed at the Institute. This cell was designed for three purposes: (1) To measure engine noise under approximately "free-field" conditions; (2) to attenuate background noise; and (3) to speed up the noise-reduction program by allowing work to be carried out on a number of noise components simultaneously.

Using this noise test cell, engines could be mounted outside and exhaust and intake noise piped in. If the engine was placed inside over-all noise measurements could be made. By piping out intake and exhaust noise the over-all mechanical noise of the unit could be measured.

The procedures used in reducing exhaust and intake noise, fan noise, mechanical noise, and the reduction of radiated sound, are given in the paper.

Properties of Gases

Some New Values of the Second Enthalpy Coefficient for Dry Air, by J. R. Andersen, Jun. ASME, University of Pennsylvania, Philadelphia, Pa. 1949 ASME Annual Meeting paper No. **49—A-40** (in type; to be published in Trans. ASME).

Measurements of the second enthalpy coefficient for dry, CO_2-free air are reported for three temperatures: 0 C, 10 C, and 30 C. These values, which are in excellent agreement with the best data on air in the literature, were formulated, together with the data of Eucken, Clusius, and Berger by the equation

$$\beta = -0.05442G(0.01226T), \text{ ft}^3/\text{lb}$$

The second virial coefficient was then calculated by means of the equation

$$B = 0.05442F(0.01226T) - 2.33 \times 10^{-5}T, \text{ ft}^3/\text{lb}$$

where the value of the constant of integration was adjusted to give the best fit with the Holborn and Schultze compressibility data. These equations represent adequately all reliable data on air in the temperature range −80 C to 200 C. The functions F and G are the well-known Lennard-Jones functions, abridged tables of which are given in the Appendix.

New Measurements of the Heat Conductivity of Steam and Nitrogen, by F. G. Keyes and D. J. Sandell, Jr., Massachusetts Institute of Technology, Cambridge, Mass. 1949 ASME Annual Meeting Paper No. **49—A-43** (in type, to be published in Trans. ASME).

The heat conductivity of steam has been measured by Timroth and Vargaftig (1940) from approximately 100 to 550 C and to pressures of 250 atm, using the hot-wire type of conductivity cell, wherein the wire of pure platinum serves as thermal emitter, and its electrical resistance change provides the temperature indication. The new measurements in the present paper were obtained using a concentric cylinder type of conductivity cell in which the heater and thermometric parts were isolated from contact with the material whose conductivity was being measured. Vargaftig had published (1937) measurements of the heat conductivity of nitrogen in substantially the same cell used for steam. The new measurements on nitrogen are in tolerable agreement with the Vargaftig measurements, but in the case of steam the new measurements are considerably lower in magnitude. A comparison of the two sets of steam data indicates some peculiarities of temperature trend in the Timroth and Vargaftig data which find no correspondence in the data of any other substance, and also differs from the trend relative to the new data. A formulation of the steam and nitrogen data is given in terms of pressure and temperature as independent variables.

Zero-Pressure Thermodynamic Properties of Carbon Monoxide and Nitrogen, by J. A. Goff, Mem. ASME, and Serge Gratch, Jun. ASME, University of Pennsylvania Thermodynamics Research Laboratory, Philadelphia, Pa. 1949 ASME Annual Meeting paper No. **49—A-50** (in type; to be published in Trans. ASME).

In this report are presented tables of the principal thermodynamic properties of carbon monoxide and of nitrogen along the zero-pressure isobar in the range 100 to 5000 deg R at the intervals indicated by the numbers in parentheses as follows: 100(5)130(10)240(20)500(50)1000(100)2000(200)5000. The data have been computed by the method of quantum statistical mechanics in the University of Pennsylvania Thermodynamics Research Laboratory under Project G-3. Computational accuracy well beyond present physical accuracy has been maintained for practical reasons. It is believed that the tables given herein should supersede all previous ones. The calculated values are in satisfactory agreement with those obtained from calorimetric and acoustic velocity measurements.

Compilation of Thermal Properties of Wind-Tunnel and Jet-Engine Gases at the National Bureau of Standards, by Harold J. Hoge, National Bureau of Standards, Washington, D. C. 1949 ASME Annual Meeting paper No. **49—A-86** (in type; to be published in Trans. ASME).

A project for the preparation of a series of tables of thermal properties of gases is described. This project was undertaken by the National Bureau of Standards at the suggestion and with the co-operation of the National Advisory Committee for Aeronautics. The scope of the project, tables now available, work in progress, and plans for the future are described. The lack of adequate data at high temperatures and also at high pressures is pointed out.

The Thermodynamic Properties of Helium, by S. W. Akin, Jun. ASME, General Electric Company, Schenectady, N. Y. 1949 ASME Annual Meeting paper No. **49—A-96** (mimeographed).

Evaluation has been made of the density, enthalpy, entropy, viscosity, and thermal conductivity of helium in the range of pressures from atmospheric to 6000 psia and at temperatures from −440 F to 600 F. These data are composed of observed values published prior to 1945 and of extrapolations based on the Beattie-Bridgeman equation of state and kinetic theory. The results evaluated to four significant figures are tabulated for particular values of pressure and temperature. Graphic plots of the same information are also presented, with an accuracy sufficient for investigations of flow and heat-transfer processes involving high-pressure helium.

To maintain consistency in the thermodynamic properties, two independent equations were used in the evaluations. The numerical results were in agreement within one half of one per cent. Where graphical solutions were necessary, plotting was arranged to permit the reading of values to a corresponding degree of accuracy.

Machine Design

The Theory and Application of Machine Guarding, by R. J. Crosby, Marsh & McLennan, New York, N. Y. 1949 ASME Annual Meeting paper No. **49—A-45** (mimeographed).

The need for machine guarding is obvious when we consider the number of accidents that involve the operation

of machines and the economic importance of these accidents to industry.

The National Safety Council reports, "Approximately one fifth of all compensated occupational injuries in manufacturing industries are caused by machinery. More significant is the fact that 25 per cent of all permanent disabilities result from machinery accidents."

Some idea of the loss in operating efficiency may be gained from the fact that approximately 24,000 disabling injuries occur annually on punch presses alone.

Add to this number the accidents on unguarded or inadequately guarded circular saws, shears, extractors, tumbling barrels, emery wheels, dough mixers, meat grinders, and others and we recognize a loss that materially detracts from the designed mechanical efficiency of the equipment in the eyes of the owner.

The following are a few general items that may be helpful to the guard designer based upon the criticisms of existing devices:

1 The guard should be designed and not just built with whatever material happens to be available. Too frequently a device is a guard in appearance only. The framework is weak and the fastenings inadequate. If the guard is subjected to motion, all bearing points should have sufficient surface to eliminate lost motion and permit accurate adjustment.

2 The guard should be constructed with the same degree of precision as the rest of the machine. It should blend in with it and not appear to be a contraption that is obvious to anyone as being an afterthought. Guards can be made attractive so that the operator does not want to remove them.

3 Wherever it is possible the guard should be interlocked in some manner so that the machine cannot be normally operated without the guard being in place.

4 The installation of the guard should not introduce additional hazards to the operation. Some of the common ones in the past have been sharp edges, pinch points, eye strain, difficulty in oiling or adjusting, and a fire hazard because its construction collected lint and dust.

Some good examples of what has been done are to be found on many of the machine tools. The moving parts of lathes have been enclosed in such a way that the guard is now an accepted part of the machine. It may be true that individual motor drive and automatic gear shifts aided materially in this development but, nevertheless, it is proof of what can be accomplished. The same may be said of types of dough mixers and some types of tumblers.

The Power Capacity of a Roller-Chain Drive Considering Wear and Vibration, by R. C. Binder, Mem. ASME, Purdue University, Lafayette, Ind. 1949 ASME Annual Meeting paper No. **49—A-101** (mimeographed).

The power capacity or rating of a roller-chain drive is an important feature to the user, designer, and manufacturer of the drive. Many successful drives have been and are in operation, and much operating experience has been gained. There is a real need, however, for a clearer picture of the mechanics of the roller-chain drive. If a rational study were available, it would help in the organization of limited data for general use, and it would help in solving the many special cases that arise.

An analytical study of a simple type of roller-chain drive considering wear and vibration is presented. The operating range of the drive is divided into two regions. Power-speed relations are given for these two regions. In one region the impressed tooth contact frequency is equal to or less than the highest natural frequency of the strand vibration. In this region vibration characteristics may be correlated with roller impact and such possible consequences as roller breakage, noise, heating, and wear of sprocket teeth. In the other region the impressed frequency is above the highest natural frequency of strand vibration, and the major factor is chain wear and elongation.

The complete mechanics of the roller-chain drive is quite complicated, and thus a completely rational solution of the power-capacity problem appears difficult. It seems that the best that can be done with the present available information is to block out a general analytical method or framework.

Numerous factors have to be considered for the general case of power rating. For example, one service requirement on the drive may be a certain limit on the chain wear elongation over a certain period of time. For an exceptionally severe application a limit may be placed on roller breakage and abuse. Another limit may be placed on the noise of the drive. Another limit may be placed on the over-all dimensions of the drive. Thus, in the general case, it may be necessary to consider various separate factors and to select one drive which will satisfy all the separate limits imposed.

A review of the numerous factors involved indicates that two main ones are wear and vibration. They have somewhat the character of major independent factors. It appears that other factors can be correlated with these two, and that the analytical framework should include these two factors, at least in major roles.

The Use of Special Machinery to Increase Production and Improve Quality at Reduced Cost, by C. A. Nichols, Delco-Remy Division, General Motors Corporation, Anderson, Ind. 1949 ASME Annual Meeting paper No. **49—A-48** (mimeographed).

The experience in the application of special machinery in a plant manufacturing automotive electric equipment is related. A period of thirty years is covered. During that time about 850 special machines have been placed in service. About 200 different designs were involved and the total value of the equipment was approximately five million dollars.

During this time the method of approach has altered from the mechanical wizard method to the use of a complete development organization. Many new materials and facilities have come into use which have aided the designer but which have required a wider knowledge to permit their use.

The classification of a machine as special would depend on whether it was used in a plant or industry where such equipment is normally required, or if it was located in a factory where such equipment is not normally in use, but where it has been found desirable to perform an operation for which it is particularly suitable. An example of this might be the use of a thread-rolling machine for knurling a shaft for a small motor. Such a machine would be considered standard in a plant making screws, but would be thought of as special in the motor plant.

A standard machine may be tooled so that in effect it is a special machine. For example, a milling machine was tooled to cut circular teeth in a file. The teeth in the face mill were set in a spiral, each tooth being of a different height. Each rotation of the cutter broached one finished tooth. The standard milling machine became a special broaching machine.

A definition of a special machine, according to the paper, is as follows: Equipment for performing one or more operations on a product where no machines are available on the open market. Automatic screw machines, cold headers, centerless grinders, are standard ma-

chines. An automatic cycling machine for undercutting micas in small commutators would be special, since there is no such machine available on the market, although standard machines for hand operation can be purchased.

Special machinery is justified if its use increases quality, decreases cost, or reduces fatigue. Almost invariably two or more of these results are achieved. Although the prime objective may be the reduction of cost it is usually found that the quality of the product is improved. This is especially true in the use of automatic machinery.

Automatic inspection is frequently incorporated in a special machine and may be used in such a manner that defective pieces may be ejected or the machine may be stopped. On more complicated equipment, signaling devices can be incorporated which will indicate the location of the trouble. This enables the operator to get the machine back into operation with a minimum amount of lost time.

Boiler Feedwater Studies

Hide-Out of Sodium Phosphate in High-Pressure Boilers, by F. G. Straub, University of Illinois, Urbana, Ill. 1949 ASME Annual Meeting paper No. **49—A-39** (in type; to be published in Trans. ASME).

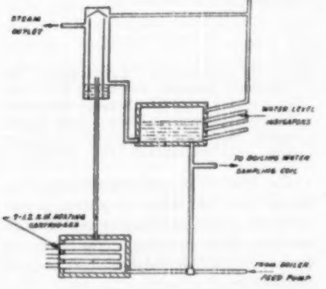
A study has been made to explain a type of hide-out of sodium phosphate in steam boilers operating at about 1700 psi. This has shown that an insoluble form of a sodium phosphate is stable at temperatures above 620 F. This type of phosphate is scale-forming and is resistant to heat transfer. This sodium phosphate does not have the properties corresponding to those of the sodium phosphates normally encountered in steam-boiler water. Analyses by chemical means, x ray, and petrographic all indicate that this is a different form of sodium phosphate.

The general trends of the tests may be summarized as follows:

1 At the boiler temperatures encountered in the pressure range of 1700 psi and above, there is present a stable insoluble sodium phosphate which will form as a deposit on the heating surface.

2 Anything which tends to raise the boiler-water temperature will precipitate more of this slightly soluble phosphate from solution. Thus a heavy deposit of calcium phosphate at the heating surface will raise the water temperature at this location and cause precipitation of the insoluble sodium phosphate, which in turn will retard heat transfer and cause still higher temperatures and more deposit. A high rate of heat input may cause temperature increase and start the deposition of the phosphate.

3 The potassium phosphate does not form an insoluble salt at these temperatures. If the ratio of sodium to potassium can be kept low, it is possible to use potassium salts instead of sodium and thus stop the occurrence of this precipitation.



HIGH-PRESSURE BOILER USED IN TESTS

Fuels

Effect of Pressure on the Combustion of Pulverized Coal, by T. T. Omori, California Institute of Technology, Pasadena, Calif., and A. A. Orning, Mem. ASME, Carnegie Institute of Technology, Pittsburgh, Pa. 1949 ASME Annual Meeting paper No. **49—A-72** (mimeographed).

With the appearance of the gas turbine as an economical prime mover, considerable interest has been aroused in the combustion of fuels under pressure. Experience with gas turbines has shown that liquid fuels can be burned under pressure with good efficiency at extremely high burning rates in terms of heat release per unit volume. While pulverized coal can also be burned in such units at very high combustion rates, at least as compared to steam-boiler practice, it has appeared more difficult to avoid high combustible losses in the fly ash. It might seem that such losses could be reduced by the simple provision of more combustion space. However, it will appear that added space will not improve combustion unless proper attention is given to flame conditions.

A study of the ignition and combustion of individual particles of pulverized coal under atmospheric pressure showed that the temperature responsible for ignition, presumably through its effect upon the initial heating rate of the fuel as it entered the furnace, had a marked effect upon the ability of residual particles to maintain ignition. Maintenance of ignition was found to be dependent upon the ability of the burning particles to maintain sufficiently high temperatures, certainly higher than 1000 C and possibly on the order of 2000 C. Accordingly, except possibly in hot slagging furnaces, residues must maintain temperatures considerably above those of their surroundings if good combustion of such particles is to be maintained as they move out of the flame into cooler parts of the furnace.

Since subsequent loss of ignition appears somehow related to the conditions under which ignition occurs, the various theoretical studies of the ignition of pulverized coal are of particular interest.

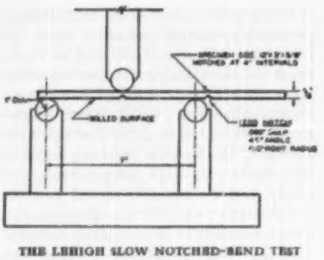
A theoretical study of heat transfer to a sphere suspended in cold air and suddenly exposed to radiation from a high-temperature source indicated an effect of air pressure which had not been disclosed by previous theoretical studies relating to the ignition of pulverized coal in air suspension. Experimental investigation, in the absence of an extended flame so that the source of radiant heat could be independently controlled, showed an adverse effect of elevated pressures upon completeness of combustion which was much larger than a beneficial effect of increased partial pressures of oxygen. It appeared that increased pressure, through a lower initial heating rate, produced less reactive combustion residues which lost ignition before combustion was complete. Complete combustion could be obtained only by increasing the radiant intensity responsible for ignition.

Pressure Vessels

Effect of Welding on Pressure-Vessel Steels, by A. F. Scotchbrook, L. Eriv, R. D. Stout, and B. G. Johnston, Mem. ASME, Lehigh University, Bethlehem, Pa. 1949 ASME Annual Meeting paper No. **49—A-49** (in type; to be published in Trans. ASME).

This paper presents the results of a study using the Lehigh slow notched-bend test to determine the effects of welding on as-received and prestrained plate. It also discusses the effects of different heat inputs in welding, the effects of plate thickness, of carbon content and deoxidation practice, and of heat-treatment after welding.

For the tests reported, six plain-carbon steels were selected from several mills to



THE LEHIGH SLOW NOTCHED-BEND TEST

cover a range of grades, carbon contents, and deoxidation practices.

It was found that:

1 Welding appreciably increased the notch sensitivity of the material. The increase could not be predicted from the transition temperature of the unwelded plate.

2 Welding prestrained material resulted in transition temperatures of slightly higher level than welding unstrained plate.

3 Welding raised the transition temperature of thick plate more than thin plate.

4 The level of transition temperature was apparently a function of carbon content and deoxidation practice.

5 An 1150-F heat-treatment after welding greatly improved the material affected by the weld. A 500-F postheat improved strained and welded material, but not unstrained welded material.

Lubrication

A Simple Hydrodynamic Thrust Bearing, by F. R. Archibald, Princeton University, Princeton, N. J. 1949 ASME Annual Meeting paper No. **49—A-29** (in type; to be published in Trans. ASME).

Considerable mathematical difficulty has handicapped the designer in the application of the hydrodynamic theory of lubrication. This difficulty arises essentially from the shapes assumed by the oil films. In 1918 Lord Rayleigh gave a detailed analysis of the simple slider bearing, neglecting the side-leakage effect, in which he determined that the greatest load capacity occurs when the slider element gives a stepped convergence to the oil film. From the simple geometry of this oil film, a solution, taking account of the side leakage, might be obtained fairly easily. The author proves this to be so, and gives solutions for the case of rectilinear motion with finite bearing width, and also the more practical sectorial case of a thrust bearing.

It is concluded that the stepped-bearing arrangement has a good deal to recommend it in practice although the bearing does not have any great advantage in load capacity over the inclined-plane bearing, and it is restricted to one direction of rotation. Offsetting these matters is its great constructional simplification over the tilting-block bearing, or even over those bearings in which the taper is machined into one of the elements. In addition, fairly simple explicit equations for the load offer some advantage in design where the influence of each parameter is fairly easy to see and can be checked quite readily. It should be possible to apply this bearing to a great many thrust problems and, in particular, to those cases where space considerations are of importance.

Some experiments of a semiquantitative nature have been made with bearing models. It is well known that precise results by this means are rather difficult to obtain. However, reasonable agreement was found. An air-lubricated model in which the step height is about 0.00005 in. has been made and is entirely successful.

The Mechanism of Lubrication Failure in High-Speed Ball Bearings, by F. C. Jones and D. F. Wilcock, Mem. ASME, General Electric Company, West Lynn, Mass. 1949 ASME Annual Meeting paper No. **49—A-36** (in type; to be published in Trans. ASME).

Tests on high-speed ball bearings were arranged, under various conditions of lubrication. Examination of bearings after partial failure has provided interesting information as to the route by which failure occurs. Despite the opinion which is sometimes expressed, that the oil film is unimportant between balls and races because of the high pressures generated beneath the ball, it was found that when lubrication fails, the first point of distress in a high-speed ball bearing occurs at the rolling contact between a ball and a race. Because of the curvature of the race, sliding as well as rolling must occur in the contact area. Hence the absence of an oil film results in friction and heat. The localized heating and resultant differential expansion of the parts cause preloading of the bearing owing to loss of internal clearance. This process progresses rapidly to cause spalling or pitting of the races and balls, skidding balls, broken ball separators, and a jammed bearing.

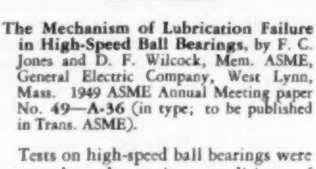


DIAGRAM OF TEST EQUIPMENT
(A, motor; B, fixed pedestal; C, flexible pedestal; D, thermocouples.)

Turbulence in High-Speed Journal Bearings, by D. F. Wilcock, Mem. ASME, General Electric Company, West Lynn, Mass. 1949 ASME Annual Meeting paper No. **49—A-37** (in type; to be published in Trans. ASME).

Measurements of the operating characteristics of journal bearings up to high surface speeds have revealed abnormalities beyond a certain critical value. A rapid increase in bearing torque, power loss, and oil-film temperature occurs as speed is increased beyond the critical value, while oil flow decreases below normal. These phenomena are attributed to the onset of instability or turbulence in the bearing oil film with an accompanying increase in energy absorption within the film. The experiments were conducted in a newly designed test apparatus capable of driving large bearings at high speeds. Maximum speed attained was 14,700 rpm, or 30,800 fpm, for an 8-in-diam bearing, and 20,000 rpm, or 21,000 fpm, for a 4-in. bearing.

The bearings used in this study are made with two longitudinal oil-distribution grooves at either side of the bearing located 90 deg from the load line. Thus the external cylindrical surface is interrupted twice by oil grooves carefully blended with it.

The transition to turbulent oil-film conditions is evidenced by (*a*) increased power consumption, (*b*) increased bearing temperature, (*c*) reduced oil flow, (*d*) a sharp break in the dimensionless shaft-eccentricity plot, and (*e*) a break in the friction-factor plot toward higher bearing friction. Feeding oil to the bearing through only the downcoming-side oil groove extends at least twofold the region of laminar oil-film behavior.

The Hydrodynamic Lubrication of Cyclically Loaded Bearings, by E. M. Simons, Jun. ASME, Battelle Memorial Institute, Columbus, Ohio. 1949 ASME Annual Meeting paper No. **49—A-41** (in type; to be published in Trans. ASME).

The results of an experimental investigation of lubricating-film thicknesses in a journal bearing subjected to various cyclic loading conditions are presented and compared with theoretical predictions.

Analytical treatments of even the

simplest cases of cyclic loading require a number of questionable assumptions in order to reduce the mathematical complexity. Such studies indicate that there are certain speed and load conditions under which it is impossible for hydrodynamic lubrication to exist.

To check the validity of the mathematical investigations and to extend the knowledge of the effect of loading conditions on hydrodynamic lubrication, the National Advisory Committee for Aeronautics authorized an experimental study of the subject at Battelle Memorial Institute.

The plan of this investigation was to construct a testing machine in which constant or varying unidirectional, or constant rotating loads could be applied, singly or together, to a precision test bearing. The effect of the load diagram on hydrodynamic lubrication could be determined from the motions of the journal in the bearing.

General agreement with the theory has been found, except in the important cases of rotating and sinusoidally alternating loads applied at one half the frequency of shaft rotation. Here, instead of the theoretical eccentricity ratio of unity, finite film thicknesses have been observed. Free whirling in an unloaded bearing has been found to occur at slightly less than one half the shaft speed. High steady loads, high shaft speeds, and low lubricant viscosities have been found to inhibit journal whirl. The dependence of eccentricity ratio upon the extent of film rupture has been demonstrated for steady loads.

Density-Pressure Relationships for Two Low-Viscosity Dimethyl Siloxanes, by S. B. Gunst, Gulf Research and Development Company and University of Pittsburgh, Pittsburgh, Pa. 1949 ASME Annual Meeting paper No. **49—A-91** (mimeographed.)

The dimethyl siloxanes are members of the group frequently called silicone liquids. They are heat-stable, chemically inert compounds. Their stability and small viscosity change with temperature suggest their potential excellence as viscometer-calibration standards, the objective which prompted this investigation.

In the rolling-ball viscometer, an instrument used for the determination of absolute viscosities of fluids at elevated pressures, the densities of the fluids under test conditions must be ascertained. This investigation was undertaken to determine the density-pressure relationships of two dimethyl siloxanes.

The instrument used to determine the liquid compressibilities is described, as is its use in the determination of density versus pressure for hexamethyldisiloxane and octamethyltrisiloxane. Results at pressures to 10,000 psi and at temperatures to 200 F for the hexamethyldisiloxane and to 300 F for the octamethyltrisiloxane are shown. The densities are precise within 0.3 per cent.

Viscosities and Densities of Lubricating Fluids From —40 to 700 F, by C. M. Murphy, J. B. Romans, and W. A. Zisman, Mem. ASME, Naval Research Laboratory, Washington, D. C. 1948 Annual Meeting paper No. **48—A-147** (in type; published in Trans. ASME, July, 1949, pages 561–574).

The viscosities and densities of a large group of high-boiling synthetic and petroleum fluids were investigated over a wide range of temperatures. These were selected because of their promise for uses at extreme temperatures or their ability to supply fundamental data for viscometry and lubrication. The variation of density with temperature was practically linear over the range investigated. The ASTM viscosity-temperature chart, extended from —100 to 700 F for this work, proved very satisfactory for analysis of the data obtained. Deviations from linearity at the extreme temperatures were studied and classified and nearly all could be explained on the basis of certain physical or chemical transformations shown to occur at the extreme temperatures. The linear portions of the graphs are explained qualitatively in terms of the ability of many types of linear molecules to coil as helixes. Convexity at high temperatures is believed general, caused by the disappearance of the helical configuration under conditions of violent thermal agitation.

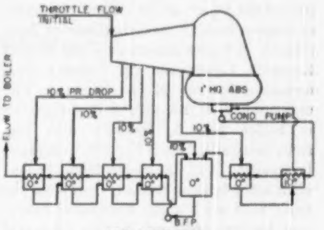
Regenerative Steam Cycle

Possibilities of the Regenerative Steam Cycle at Temperatures Up to 1600 F, by P. H. Knowlton, Mem. ASME, General Electric Company, Schenectady, N. Y., and R. W. Hartwell, Jun. ASME, The Detroit Edison Company, Detroit, Mich. 1949 ASME Annual Meeting paper No. **49—A-33** (mimeographed).

As the cost of fuel increases, it becomes more important to evaluate the savings which might be effected by increasing the steam temperatures in the power plant of the future. Because of the wide general interest in this problem, the ASME Special Research Committee on High Temperature Steam Generation requested the authors to prepare a paper covering two points, (1) the probable thermal gains by the use of high-temperature steam in the regenerative cycle, and (2) the possible fuel savings that might result.

The regenerative-steam-cycle heat-rate gains that may be realized at temperatures up to 1600 F are presented. These gains are calculated for a theoretical cycle and also for a practical cycle wherein such losses as extraction piping pressure drop, heater terminal temperature differences, etc., are considered. An economic evaluation of the anticipated turbine-heat-rate differences for various throttle conditions is presented. This evaluation includes such factors as fuel costs, load characteristics, auxiliary power requirements, boiler efficiencies and annual fixed charges. A method of comparing the heat-rate gains due to higher steam temperatures with those made possible by resuperheating is provided.

It is found that the practical cycle



ASSUMPTIONS

1- TERMINAL DIFFERENCES AS INDICATED

2- 10% PRESSURE DROPS FROM STAGE TO HEATER

3- STEAM PRESS.	860	1250	1450	2000	2500	3000
4- B.F.P. DISCH PRESS.	1000	1450	1700	2300	2900	3450
5- ENTHALPY RISE IN BFP, BTU/LB.	4.1	6.3	7.6	10.3	12.9	15.4
6- NO OF HEATERS (CHANGING NUMBER OF HP HEATERS)	4	5	6	7	9	10
7- BOILER FEED TEMP, F	380	434	458	516	556	590

8- ENTHALPY RISE IN CONDENSATE PUMP 0.6 BTU/LB

PRACTICAL CYCLE HEATER ARRANGEMENT FOR HEAT-RATE CALCULATIONS

shows less improvement with increasing pressure, and more improvement with increasing temperature, than the theoretical cycle. This relationship results from the fact that the practical turbine loses in efficiency with increasing pressure, and gains in efficiency with increasing temperature, while the theoretical turbine is assumed to be always 100 per cent efficient. These trends are not at all new; the only novel feature is the extrapolation of the trends to show what economies may be expected at temperatures up to 1600 F and pressures up to 3000 psia. It is believed that this has been done in a reasonable manner consistent with past practice.

Use of steam temperatures in power plants above the present maximum of 1050 F will depend on the development of suitable materials for the higher temperatures, and on the design of acceptable equipment, particularly boilers and turbines, at a cost commensurate with the thermal gains to be realized. Since the costs of such materials and equipment are not presently available, this paper has presented only the total investment which could be justified on the basis of the thermal gains expected at the higher steam conditions.

Furnace Performance Factors

Furnace Heat Absorption in Paddy's Run Pulverized-Coal-Fired Steam Generator, Using Turbulent Burners, Louisville, Ky.—Part II Furnace Heat-Absorption Efficiency as Shown by Temperature and Composition of Gases Leaving the Furnace, by R. C. Corey, Mem. ASME, and Paul Cohen, Mem. ASME, Bureau of Mines, Pittsburgh, Pa. 1949 ASME Annual Meeting paper No. **49—A-42** (in type; to be published in Trans. ASME).

This paper presents the results of determinations of the heat-absorption efficiency of a central-station, pulverized-coal-fired, steam-boiler furnace, for a variety of operating conditions. It is part of the report of the second of a series of comprehensive investigations of heat transfer in boiler furnaces by the Special Research Committee on Furnace Performance Factors of the Society. The unit studied in this second investigation is boiler No. 3, Paddy's Run Station, Louisville Gas & Electric Company, Louisville, Ky., a single-drum boiler, with a dry-bottom furnace, fired from the front wall with eight horizontal turbulent burners arranged in two rows and rated at 640,000 lb of steam per hr at 950 psig and 900 F at the superheater outlet.

The investigation of this unit by the committee consisted of two parts, namely, determination of the total heat absorption in the furnace, which is the subject of this paper, and determination of the distribution of heat absorption in the furnace, the subject of another paper of this symposium. The furnace heat-absorption tests were made by the Combustion Research Section of the Bureau of Mines, concurrently with the other studies, as part of the Bureau of Mines co-operative research program with the committee to study the effect of ash and slag on furnace performance.

Fifteen tests were made to determine the effect on furnace heat absorption of variations of load, excess air, adjustment of the turbulent burners, and, at low loads, the number and location of the burners used. The heat absorption is defined as the heat transferred by convection to the furnace walls, not including the screen, and the heat transferred by radiation to the furnace walls, including the screen. With slight modification, the test procedure is that of Method *b* of the ASME Test Code for Stationary Steam-Generating Units. The heat absorption in the furnace is obtained as the difference between the net heat available in the furnace (the low-heat value of the fuel fired, corrected for unburned combustible, plus the sensible heat in the air used for combustion) and the sensible heat in the furnace-outlet gases and the refuse, and the heat transferred from the furnace casing.

The sensible heat in the furnace-outlet gas was calculated from the temperature and composition determined by techniques appropriate for furnace testing. Measurements were made at a number of positions approximating the furnace outlet within the limitations of the available means of access to the furnace. Because of the significance of the distribution of the temperature and composition of the gases at the furnace outlet, the complete test data are tabulated in the paper.

Reheat Turbines

Developments in Resuperheating in Steam Power Plants, by E. E. Harris and A. O. White, Mem. ASME, General Electric Company, Schenectady, N. Y. 1948 ASME Annual Meeting paper No. **48—A-125** (in type; published in Trans. ASME, August, 1949, pages 685–691).

Both steam and gas reheaters have been used for a number of years, and this paper is devoted to a discussion and evaluation of the gains in thermal efficiency as reflected in turbine heat rate realizable in modern steam turbines for central stations. The gains due to reheat are justified economically with present equipment and fuel costs. They represent an additional gain in fuel economy over and above the normal annual gain.

Reheating in Steam Turbines, by R. L. Reynolds, Mem. ASME, Westinghouse Electric Corporation, Lester, Pa. 1948 ASME Annual Meeting paper No. **48—A-141** (in type; published in Trans. ASME, August, 1949, pages 701–706).

This paper outlines the history of the reheat cycle, in which steam is resuperheated after expanding through the high-pressure section of the turbine, and shows the improvement in thermal efficiency to be derived from its use under various operating conditions. Such factors as regenerative feedwater heating, pressure drop through the reheater and its piping, and the temperature to which steam is reheated are discussed.

ASME Transactions for December, 1949

THE December, 1949, issue of the Transactions of the ASME, which is the *Journal of Applied Mechanics*, contains the following:

TECHNICAL PAPERS

Supersonic Flow Past Airfoil Tips, by Leon Beskin. (Paper No. 48—A-23)

Discontinuities of Stress in Plane Plastic Flow, by Alice Winzer and G. F. Carrier. (49—APM-8)

Relation of Experiments to Mathematical Theories of Plasticity, by D. C. Drucker. (49—APM-5)

The Calculated Performance of Dynamically Loaded Sleeve Bearings—II, by J. T. Burwell.

A Matrix Method of Calculating Propeller-Blade Moments and Deflections, by R. Plunkett. (49—APM-11)

Impact of a Mass on a Column, by W. H. Hoppmann, 2nd. (49—APM-9)

Vibration of Multifrequency Systems During Acceleration Through Critical Speeds, by G. D. McCann, Jr., and R. R. Bennett. (49—APM-10)

Biaxial Tension-Tension Fatigue Strengths of Metals, by Joseph Marin. (49—APM-7)

Bending Vibration of a Rotating Blade Vibrating in the Plane of Rotation, by R. L. Sutherland. (49—APM-6)

On Vibrations of a Two-Bar Elastic System With a Small Rise, by S. Woinowsky-Krieger. (49—APM-1)

On Torsion of Plastic Bars, by P. G. Hodge, Jr. (49—APM-3)

Determination of the Buckling Load for Columns of Variable Stiffness, by C. C. Miesse. (49—APM-4)

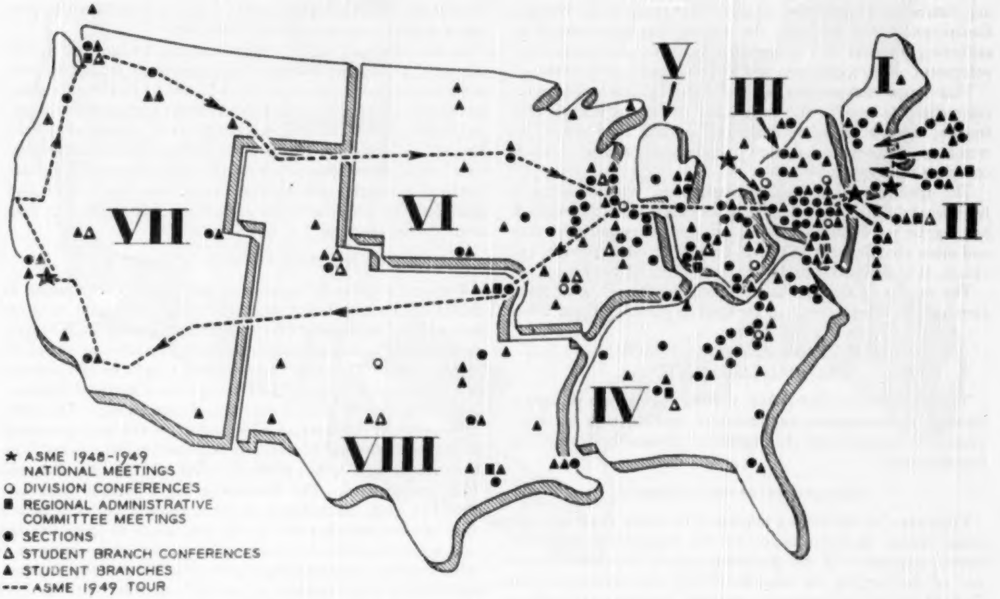
A Force Applied in the Median Plane at the Center of a Circular Insert in a Plate, by S. J. Dokos. (49—APM-19)

DISCUSSION

On Previously Published Papers by Che-Tyan Chang; R. P. Eddy and F. S. Shaw; R. C. Grassi and I. Cornet; Gustaf Lundberg and Arvid Palmgren; E. P. Neumann and F. Lustwerk; H. I. Ansoff; M. A. Sadowsky and E. Sternberg; F. M. Sauer and G. F. Garland; W. T. Thomson.

BOOK REVIEWS

GEOGRAPHICAL PATTERN OF ASME ACTIVITIES IN 1948-1949



To ASME Members:

THE COUNCIL REPORTS FOR 1949

High Lights

GENERAL HIGH LEVEL

The Society completed its sixty-ninth year with continued record of useful activities.

NATIONAL

Progress made in formulating ideas prerequisite to organization of the engineering profession.

INTERNATIONAL

Continued program of international co-operation involving interchange of information and personnel. Unified screw-threads standards adopted by Great Britain, Canada, and the United States. International standardization projects initiated.

PUBLICATIONS

New publications plan judged basically sound. More preprints available in advance of meetings.

MEETINGS

Twelve national meetings and conferences at good technical level. Improvements in getting papers in advance improves discussion and coverage in daily press. 812 Section Meetings; 712 Student Branch Meetings.

STUDENT ACTIVITIES

127 student branches; 12 regional conferences; 712 meetings; 5000 increase in membership.

MEMBERSHIP

New high, 30,680 members.

THE American Society of Mechanical Engineers continued during the year to influence national and international trends in engineering thought in a world of conflicting economic, social, and ideological forces. Cultivating at home a co-operative atmosphere prerequisite for unification of the engineering profession, and accepting responsibility for rallying American support for international projects in Western Europe and Latin America, the Society was instrumental in achieving progress in engineering education, professional development, standardization, and international understanding.

This report summarizes Society contributions under three categories: Service to the nation and to the engineering profession; service of an international nature; and service to members. Reports on Society administration and finances complete this report.

The advances in mechanical engineering which reached a high level during the year were made public through meetings and regular publications and through the reports of its research and other technical committees. Because of their diversity and extent, it is impossible to do justice to them in this report.

The success of the year is due to the contributions of many members, to whom the Council expresses grateful appreciation.

I NATIONAL AND PROFESSIONAL ACCOMPLISHMENTS

The Society serves the public and the engineering profession through its committees and members, and through the Engineers Joint Council[1] and the Engineers' Council for Professional Development.

ORGANIZATION OF THE PROFESSION

Cognizant of the feeling expressed by many engineers that some change in organization of the engineering profession seemed imperative if the profession was to improve the manner of discharging its responsibilities, the Engineers Joint Council invited 15 engineering societies to meet in October to discuss ways and means for increasing unity in the profession.

As a guide to Society policy on greater unity, the ASME Regional Delegates Conference reported to Council at San Francisco the desire of the membership for a closer relationship between various engineering societies both at the national and local level, and reaffirmed its resolution of 1948 for continued effort toward unification of the profession.

In the meantime steps were taken to strengthen the Engineers Joint Council. A new constitution was adopted which provided for new committee structure, admission of additional member organizations, and streamlined administrative procedures.

As a further step toward unification of the profession, the office of the Secretary of the Society participated in a conference of engineering-society secretaries at Pittsburgh, Pa., in June, 1949, at which 21 organizations were represented. The agenda covered important relations between national and local societies and dealt with program making, publications, and other important operating problems.

PROFESSIONAL DEVELOPMENT

The Society contributed to the professional development of the young engineer through the Engineers' Council for Professional Development and its committees on Student Selection and Guidance, Engineering Schools, Professional Training, and Professional Development. The accrediting of engineering schools by ECPD was continued with the inspection of 64 new curriculums and reinspection of 250 others. ECPD guidance literature was augmented by addition of the long-awaited "Professional Guide for Junior Engineers" by the late Dr. W. E. Wickenden. Other ECPD publications were reviewed and stocks replenished. The testing program for engineering students was amalgamated with that of the College Entrance Examinations Board to provide for more economical administration.

As an important step in increasing the recognition of the engineer, a standard for minimum grades of membership in national engineering societies was adopted by ECPD and recommended to constituent societies to which such grades are appropriate. The ECPD action was approved in principle by the Executive Committee of the Society, but action has been deferred until after discussion with the eight Regional Administrative Committees and after assurance that the other major societies will simultaneously submit the new grades to their members for adoption.

CONSULTATIVE BODY TO ECPD

Pursuing a policy of broadening the base of participation in ECPD and decentralizing its activities, a seven-point program was adopted as the basis for co-operation among ECPD representatives of other national engineering societies at the local-section level. The same objective was sought by the creation of a consultative body to ECPD composed of national engineering societies in the field of mechanical engineering. This body represents the culmination of a project of the Society started in 1947 with the first Mechanical Engineering Educational Conference in which ASEE, ASHVE, ASRE, ASTE, IAS, ISA, and SAE, participated. The discussions begun in 1947 were continued in 1948. Such topics as the advisability of establishing joint student branches at the colleges, trends to specialization in engineering education, and contribution of engineering societies to better understanding of the obligations of the engineer, indicated a large measure of mutual interest. At the 1949 Conference a discussion of the work and plans of the ECPD led to the decision to continue the conference as a consultative body to ECPD, with representation of five of the bodies mentioned.

ENGINEERING OPPORTUNITIES

The EJC created a General Survey Committee to secure reliable information concerning significant trends in the engineering profession. The Committee's survey in 1949 (published in MECHANICAL ENGINEERING, pages 665–668, August, 1949) revealed a 21 per cent anticipated decrease in opportunities for the young graduate. This type of report, which was well received, is expected to be issued annually.

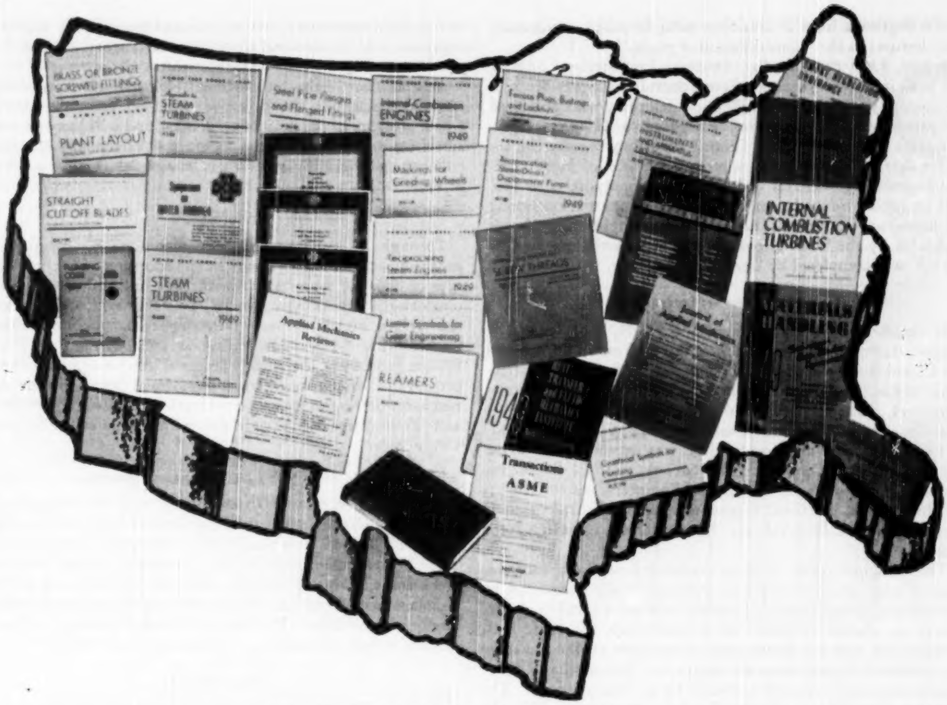
PUBLIC SERVICE

With a view to making the special skills of the profession available to Federal legislative and administrative agencies a number of important steps were taken. A Washington task group of prominent engineers was organized. Conferences were held with the Hoover Commission on governmental reorganization. Aid was given to the Economic Cooperation Administration in the selection of key personnel. Names were suggested as members of the National Science Foundation which was expected to be established by legislation. A panel of engineers advocated the retention in labor legislation of provisions now in the Taft-Hartley Act which protect the professional status of engineers. In all activities ASME members served.

ENGINEERING MAN POWER

For the EJC the Society undertook a "contract with the Office

[1] A body made up of two past-presidents, and the secretary of each of the following engineering societies: American Society of Civil Engineers; American Institute of Mining and Metallurgical Engineers; The American Society of Mechanical Engineers; the American Institute of Electrical Engineers; and the American Institute of Chemical Engineers.



ASME PUBLICATIONS SERVE MEMBERS THROUGHOUT U.S.A.

(100,000 copies of technical papers, 65,000 standards, 6000 special publications, and some 3000 nonmember subscriptions to MECHANICAL ENGINEERING were purchased by American industry and the engineering profession during 1948–1949.)

of Naval Research," to create a national source file of key engineers in research and development as a working tool for the National Military Establishment. Questionnaires were mailed to 100,000 qualified professional engineers holding grade of member or higher in 18 national engineering societies. Nearly half of the questionnaires have already been returned and are being processed.

TOWN HALL MEETING

Fifteen million radio listeners were made aware in November, 1948, that the engineering profession is cognizant and confident of the economic and social effects of engineering contributions. The occasion was the American Town Hall Meeting of the Air broadcast and telecast, held under the sponsorship of the ASME Engineers Civic Responsibility Committee, during which Past-President William L. Batt and Leonard J. Fletcher, Mem. ASME, presented the engineering point of view on the topic, "Are Our Ideas Being Destroyed by the Machine Age?"

NUCLEAR ENERGY

To acquaint industrial and executive heads of engineering divisions with the fundamentals of nuclear energy, the Society prepared a special educational program now under consideration by the Atomic Energy Commission.

Work on the glossary of nuclear-energy terms was continued during the year. Section VI on Biophysics has been completed and will be available for sale soon. Other sections are being reviewed and should be ready for publication early in 1950. Development of the glossary, upon suggestion of co-operating societies, was placed under the general direction of the National Research Council because the subject matter covers such a variety of scientific and engineering fields.

II INTERNATIONAL ACTIVITIES

The Society continued its time-honored policy of co-operation with engineers in other nations by participating in many activities of international import. These activities are directed by Society officers and committees and are carried on in co-operation with the EJC Committee on International Relations.

Under the auspices of EJC, members of the Society were able to render useful assistance to several groups of foreign representatives visiting U.S.A. to learn methods of increasing productivity in their own countries. In particular, two British teams of experts received assistance from ASME. One seeking experience in standardization and simplification was aided by the ASME standards activity. A second team, including official appointees of British engineering institutions seeking information on materials handling, received direct aid from the ASME Materials Handling Division. In October, 1948, EJC entertained a delegation of 38 distinguished engineers from Brazil.

In March, 1949, the Society was represented at the Second International Technical Congress held in Cairo. The congress, sponsored by the World Engineering Conference, was attended

by 600 engineers from 26 countries who discussed engineering contributions to the "consolidation of peace."

In July, 1949, the First Pan-American Engineering Congress was held in Rio de Janeiro. Five honorary vice-presidents of the Society were among the 43 U. S. delegates who presented 104 papers by U. S. engineers. Preceding the Congress, representatives of the South and Central American engineering societies drafted a charter for a proposed Union of Pan-American Engineering Societies (UPADI) whose purpose is to provide an agency for exchange of engineering information among the Americas. A survey of Latin-American engineering schools sponsored by the U. S. Department of State and supported by the EJC was completed by Dean S. S. Steinberg.

WESTERN EUROPEAN CONFERENCE

In October, 1948, and in September, 1949, a conference of representatives of Engineering Societies in Western Europe and the United States was convened in London by the British Institutions of Civil Engineers, Mechanical Engineers, and Electrical Engineers. In addition to the three British Institutions, one national society each from Belgium, Denmark, France, Holland, Norway, Sweden, and Switzerland was represented. From the United States, the American Society of Civil Engineers, The American Society of Mechanical Engineers, and the American Institute of Electrical Engineers were represented by their secretaries who collectively also represented the Engineers Joint Council.

The principal result of these conferences was the formulation of a set of simple rules for continuing the Conference to provide a clearinghouse of operating information and an opportunity to discuss problems of common concern. One such problem has arisen from the various activities looking to some international organization of engineers. The results of these conferences were reported in MECHANICAL ENGINEERING. The meeting of minds at the London Conferences augurs well for the usefulness of the Conference as a means of international collaboration.

SECRETARY'S EUROPEAN TRIP

Preceding and following the two London Conferences, the Secretary visited the engineering societies of France, Switzerland, Sweden, Belgium, Germany, and Italy. He was able to report that the prestige of ASME is at a high point in all these countries and that contacts were made that will result in future specifically useful collaboration.

UNESCO

R. M. Gates, past-president ASME, was reappointed EJC representative on the U. S. National Commission for the United Nations Educational, Scientific, and Cultural Organization (UNESCO). He attended the meeting of the Natural Science Division of the U. S. National Commission held in Boston in September, 1948, where international problems of engineering education were discussed; and in March, 1949, at the Second National Conference of the Commission at Cleveland, he presented convincing evidence to a mixed audience, whose interest lay primarily outside the scope of the engineering profession, that engineers had much to contribute to the task of international co-operation.

H. V. Coes, past-president ASME, represented Mr. Gates at meetings of a committee of experts held during the summer at UNESCO House, Paris, which resulted in a proposal to be worked out in 1950 for co-ordination of the activities of international engineering bodies.

APPLIED MECHANICS

To co-ordinate activities of U. S. workers in theoretical and applied mechanics, seven national engineering societies organized a U. S. National Committee on Theoretical and Applied Mechanics with the ASME providing the secretariat.

As a member of the International Union of Theoretical and Applied Mechanics, the new body will represent the United States workers in the field of mechanics, and will carry on such activities as directed by the Union. Future plans include a colloquium on geophysics and a meeting of the Union in Rome in 1950.

STANDARDS

Through its standardization activities the Society participated in a major achievement in the adoption after three decades of effort of a unified screw-threads standard for the principal English-speaking countries, Great Britain, Canada, and the United States. Upon invitation from the International Organization for Standardization at its conference in Paris, France, June, 1949, the Society accepted secretariat for two projects: (1) Formulation of an international screw-threads system based on Anglo-American unification already accomplished; and (2) an international code for steam boilers and other pressure vessels.

EIC-ASME JOINT CONFERENCE COMMITTEE

The Society continued to co-operate with The Engineering Institute of Canada under the agreement of 1945. At meetings of the EIC-ASME Joint Conference Committee, progress was made in the appointment of EIC members to ASME technical committees, and in the matter of increasing benefits of student membership through joint student-branch activities in Canadian engineering schools. The Society extended privileges of membership at national meetings to members of the EIC.

SCHOLARSHIPS

The two Freeman scholars from China have completed their studies in the application of mechanical engineering to agriculture and are awaiting settled conditions in China before returning. One of the scholars is developing a rice-transplanting machine that should be of real value to the rice industry. A joint meeting of the Freeman Award Committees of the ASME, the American Society of Civil Engineers, and Boston Society of Civil Engineers was held to discuss a number of proposals for joint action.

The Calvin W. Rice Memorial Scholarship, established by the Woman's Auxiliary to aid overseas students, was awarded to Ralph Liljehund of Helsinki, Finland, who is studying at Purdue University.

III SERVICE TO MEMBERS

PUBLICATIONS

A study of experience with the new publications plan under which the Society has been operating since January, 1948, was completed during the year. This plan provides a new digest service in MECHANICAL ENGINEERING; increases the number of papers available in pamphlet form for distribution at nominal cost to cover handling and mailing; discontinues free preprints at national meetings; and establishes Transactions and *Journal of Applied Mechanics* on a subscription basis.

Following a discussion of the plan at the Regional Delegates Conference at San Francisco, the following resolution was adopted:

"It is the opinion of the 1949 Regional Delegates Conference that the present publication plan is sound in principle, although it is apparent that some of the details of distribution of papers and publications require further study. The Conference com-

mends the Publications Committee for its work to date and urges continued effort on its part to resolve the problems of distribution in accordance with the wishes of the membership as expressed in motions previously passed by this Conference and consistent with good economy and member relations. It is also urged that the Publications Committee publish in the current year a review of the present publications plan outlining the general policies, costs, problems, and other pertinent information that will adequately inform the membership."

In accordance with the resolution the Publications Committee prepared a report on its survey of experience with the plan which lists four conclusions:

(1) That the new publications plan is basically sound; (2) that Transactions and *Journal of Applied Mechanics* should be continued on a subscription basis; (3) that operation of the preprint system should be made more convenient for members; and (4) that MECHANICAL ENGINEERING should be improved to provide a broader general service in the field of mechanical engineering. The complete report was published in the December issue of MECHANICAL ENGINEERING, pages 1032–1033.

Publication of *Applied Mechanics Reviews*, an abstract journal of world literature in applied mechanics, was continued with 2004 subscribers as of July, 1949.

Progress was reported on the Metals Engineering Handbook, Part III of which is nearing completion in manuscript form and should be in type soon. During the year 20 new publications were offered for sale, an increase over 1948 of 13. Advertising receipts from MECHANICAL ENGINEERING and from ASME Mechanical Catalog were slightly higher than last year, the increase in rates offsetting a decrease in the number of pages published.

MEETINGS

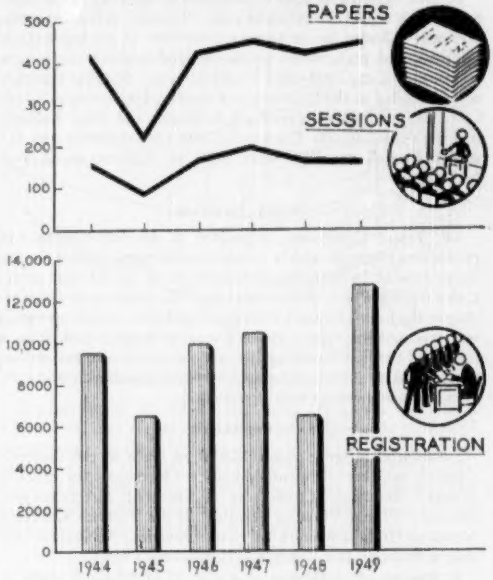
Twelve national meetings and division conferences attracted an audience of 12,687 (see Table 1). The meetings were generally better planned and conducted, primarily because of the program-making conference sponsored at the 1948 Annual Meeting by the Professional Divisions Committee. Continued emphasis by the Meetings Committee on adherence to the 90-day rule for submitting papers resulted in papers of higher quality and the availability of a greater number of them at time of meetings. This procedure allows time for adequate review of papers and production of preprint copies.

TABLE 1

Meetings	Number of sessions	Number of papers	Attendance
Petroleum Conference, Oct. 3–6, 1948, Amarillo, Texas	16	37	300
Wood Industries Conference, Oct. 14–15, 1948, High Point, N. C.	3	10	100
Fuels Conference, Nov. 3–4, 1948, White Sulphur Springs, W. Va.	3	8	270
Annual Meeting, Nov. 28–Dec. 3, 1948, New York, N. Y.	72	205	5296
Materials Handling and Management Conference, Jan. 10–14, 1949, Philadelphia, Pa.	8	28	3500
Oil and Gas Power Conference, April 25–29, 1949, Chicago, Ill.	3	8	300
Spring Meeting, May 2–4, 1949, New London, Conn.	15	36	603
Applied Mechanics, June 13–15, 1949, Ann Arbor, Mich.	6	28	210
Semi-Annual Meeting, June 27–30, 1949, San Francisco, Calif.	24	58	933
Industrial Instruments and Regulators Conference, Sept. 12–16, 1949, St. Louis, Mo.	3	6	400*
Wood Industries Conference, Sept. 27, 1949, Jamestown, N. Y.	2	6	75
Fall Meeting, Sept. 28–30, 1949, Erie, Pa.	20	47	650*
	175	477	12,687

* Estimated

ASME SESSIONS–PAPERS–REGISTRATION



MORE MEMBERS THAN EVER BEFORE REGISTERED AT ASME NATIONAL MEETINGS AND CONFERENCES DURING 1948–1949

As one of the features connected with the Semi-Annual Meeting at San Francisco, a 26-day trip was conducted for members from the East attending the meeting.

Society meetings continued to get favorable notice in the daily press.

PROFESSIONAL DIVISIONS

As usual, Professional Divisions of the Society focused on improving program-making procedures and providing programs which made available to members information on latest engineering developments. It is interesting to note that Professional Divisions activity represents substantial Society undertaking. There are more than 152 committees in the Professional Division structure manned by 1104 persons.

SECTIONS

The membership and activity in the 73 Sections and 5 Subsections are worthy of note. The Sections held 812 meetings providing, in general, an excellent balance of meetings throughout the year. Southern California with 133 meetings held through twelve months tops the list, with Metropolitan next with 45, followed by Chicago and Philadelphia with 28 each. In membership Metropolitan holds the lead with 5344, with Philadelphia in traditional second place with 1872 but closely pressed by Chicago with 1789, and Southern California with 1546. Boston is next in size with 1047 members, passing the thousand mark this year for the first time. New Sections were established in Arizona and at Chattanooga.

STUDENTS

Persons enrolled as student members number 20,785 as compared with 15,025 the previous year. Increase of student members was reflected in an increased number of student-branch meetings and registration at 12 regional student conferences which closed the 1948–1949 academic year. Student branches were installed at the University of Denver, University of South Carolina, Louisiana Polytechnic Institute, and Fenn College, making a total of 127. During the 1948–1949 academic year 712 student-branch meetings were held, an increase of 34 over last year.

JUNIOR MEMBERS

The Junior Committee, organized to develop policies and procedures through which junior-member participation in the Society could be stimulated, completed its second year of activity during which it met six times. In addition to sponsorship of the Junior Forum in MECHANICAL ENGINEERING, progress was reported in preparation of a student-member pamphlet, a review of the ECPD reading list, and an operational manual for junior groups. One new junior group was organized during the year and many others were reactivated.

RESEARCH

Substantial progress was achieved on eight of the Society's research projects: Pressure-Viscosity Characteristics of Lubricants; Discharge Coefficients of Eccentric and Segmental Orifices; Plastic Flow in Metals; Boiler Furnace Research; Metals at High Temperatures; Gas Properties; Manual on Cutting of Metals; and Automatic Regulation Theory.

A new project dealing with action of superheated steam in the 1500 F temperature range was outlined and promises to win the support of industry. These projects illustrate the Society's policy of serving as a catalyst in solving problems common to one or more industries.

CODES AND STANDARDS

During the year 26 standards and revisions to standards were adopted as standards of the Society. Of these, 21 were recommended as American Standards, an increase of 14 over last year Forty-five other standards have already been issued in preliminary form and should be completed in the coming year.

Mentioned elsewhere in this report is the final adoption of the Unified Screw-Thread Standard by Great Britain, Canada, and the United States, a project carried on by the Sectional Committee on Screw Threads (B1) under the procedures of the American Standards Association.

The Society also accepted the secretariat of an international project for steam boilers and other pressure vessels.

Two other major projects completed were: the American Standard Plumbing Code and Section VIII (Unfired Pressure Vessels of the ASME Boiler Construction Code).

Four sectional committees were reorganized and a new sectional committee on standardization of V-belt drives was organized. Two obsolete projects were terminated.

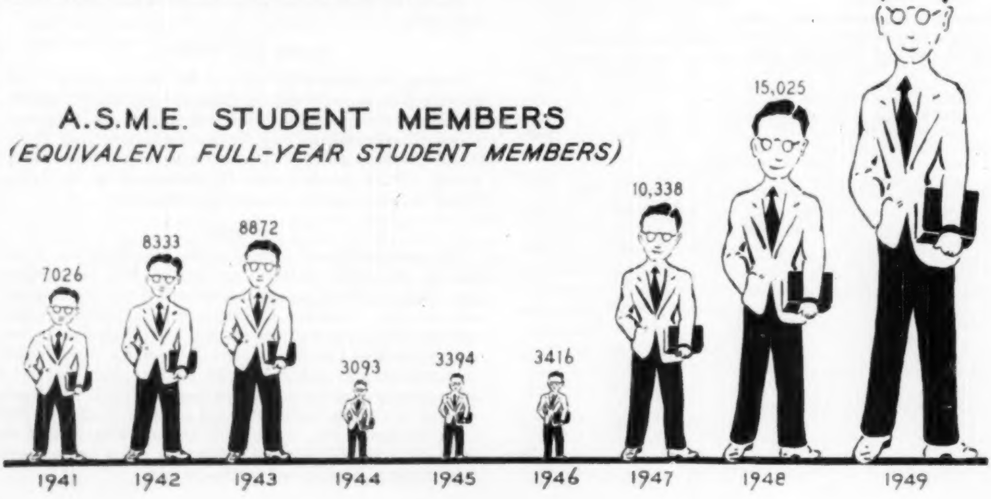
Work on the safety code for industrial power trucks is nearing completion and should receive final approval early in 1950. A safety code for manlifts was completed in preliminary form and should be approved soon. Revision of the safety code for elevators is also expected in 1950.

The Power Test Codes Committee continued its review of the present status of power test codes. A new PTC committee on testing and rating of safety and relief valves is in process of organization.

LIBRARY

To expedite policy decisions, the Engineering Societies Library Board reduced its membership from 22 to 12 and constituted itself as a working committee. To determine what industry needed and was willing to pay for in way of library service the Engineering Foundation financed a survey of library operations which was concluded in the spring. As a result of recommendations, a comprehensive photostat service was instituted on a trial basis as a new service to industry. The board also adopted a policy of disposing of little-used material to allow more space for new acquisitions.

During the year the Library served 22,921 callers and 15,908 requests by mail and phone. Five thousand books and pamphlets were added to the collection. Income from service amounts to 25 per cent of total library income as compared with 15 per



cent in previous years. The crowding of library shelves still continues a serious problem. The director of the Library attended a UNESCO conference in London which explored means for increasing coverage and improving distribution of abstracts of science articles containing new information.

ENGINEERING SOCIETIES BUILDING

In the Engineering Societies Building much deferred maintenance requires attention and it may be necessary soon to install new elevators. During the year all exit stairways were enclosed by firewalls virtually creating inside fire escapes. Sufficient accumulated reserves are on hand to cover necessary replacements and to make some improvements. Consideration is being given to the securing of a more desirable building.

IV ADMINISTRATION AND ORGANIZATION

REGIONAL ADMINISTRATION

The fourth year of operation of the plan under which the Vice-President selected by each Region exercises responsibility for work of Sections and Branches in his Region, gave evidence of strengthening local administration and the emergence of a tradition of decentralized administration which is providing an effective training ground for national leadership in the Society.

Reports from the Vice-Presidents indicate a continuation of imagination and initiation in Section projects designed to serve the particular conditions within regions. The enthusiasm for civic projects and those which tend to enhance the prestige of the engineer in his own community is uncovering man-power resources and arousing nascent administrative talents. The reports from the Regions augur well for the Society.

The Eight Regional Administrative Conferences held during the spring not only scrutinized progress in their respective regions but also gave careful thought to matters of national import. The effective organization of the Regions was reflected in the deliberations of the Regional Delegates Conference held in San Francisco, whose major recommendations to Council are reported under "National and Professional Accomplishments" and "Service to Members."

ORGANIZATION COMMITTEE

The Organization Committee continued its work of scrutinizing names proposed for committee service. During the year the Committee held five meetings at which approximately 200 nominations for appointment to about 100 boards, committees, and joint activities were screened before recommendations were made to the Executive Committee. Progress was made in developing a method of making information about prospective committee members more generally available.

PRESIDENT JAMES M. TODD'S 1948-1949 ITINERARY

CONSTITUTION, BY-LAWS, AND RULES

Changes made to the Constitution, By-Laws, and Rules during the year served to clarify the language or to amend regulations to permit slight changes in practice. The most important of these was the change in the By-laws permitting applicants for membership to use as references any persons qualified to judge his professional ability rather than only those who are officers or voting members of other societies.

MEMBERSHIP

The membership of the Society reached 30,680 at the end of the year, a new high (see Table 2). Part of the increase was due to the record numbers of engineering graduates who are transferring from student member to junior member.

COUNCIL

The Council met twice, at New York, N. Y., November, 1948, and at San Francisco, Calif., June, 1949. Vice-Presidents also held meetings at the 1948 Annual Meeting and the 1949 Semi-Annual Meeting. The Executive Committee of the Council met six times.

During the year the president visited 23 student branches and 26 Sections at which 9 student branches were represented.

DEATHS

Among the 192 members of the Society who died during the year was Roscoe W. Morton, who died on May 2, 1949. Mr. Morton had served the Society as Manager in 1942–1945.

TABLE 2 CHANGES IN MEMBERSHIP

(10/1/48 to 9/30/49)

	Membership		Increases			Decreases				Changes		
	Sept. 30 1948	Sept. 30 1949	Transferred to	Elected	Reinstated	Transferred from	Resigned	Dropped	Died	Increases	Decreases	Net change
Honorary members	45	45										
Fellows	262	284	30				1	1	6	30	8	+ 22
Members	11372	12137	324	679	151	30	103	96	161	1157	390	+ 765
Associates	370	382		31	3	4	8	6	4	34	22	+ 12
Juniors (20)	3161	3511	650	128	37	215	71	173	6	815	465	+ 350
Juniors (15)	2791	3161	1073	275	11	734	73	154	8	1359	989	+ 370
Juniors (10)	8575	11160		4056	21	1074	115	296	7	4077	1492	+2585
Total membership	26376	30680	2077	5169	224	2077	371	726	192	7472	3366	+4104

WOMAN'S AUXILIARY

The number of local sections of the ASME Woman's Auxiliary was increased by three during the year, the new sections being Boston, Toledo, and Pittsburgh. Greater activity and further expansion were reported by sections in New York, Chicago, Cleveland, Los Angeles, Philadelphia, and Milwaukee. The Chicago section did splendid service during the Oil and Gas Power Conference and the Chicago meeting of the Boiler Code Committee in May, 1949.

SECRETARY'S OFFICE

Mrs. G. S. Wood, member of the staff for 28 years, died on June 18, 1949. Miss Martha Jurist resigned as assistant secretary to the Boiler Code Committee. E. H. Anderson was added to staff as assistant to meetings manager, and Mrs. Dorothy M. Shackelford as executive assistant to standards manager. Frederick Lask, advertising manager, completed his thirty-fifth year with the Society, and Marguerite Marty and August W. Schrage completed their thirtieth year.

ASME Finances

FINANCES[1]

The income of the Society for the year exceeded $1,100,000, the largest income in the history of the Society. The policy of the Council was to use the income of the Society for service to the members. A net income over expense of $4.25 is reported. This amount plus initiation and transfer fees amounting to $28,755, make a total addition to surplus for the year of $28,759.25.

The Balance Sheet of September 30, 1949, shows, on that date, that the Society owed:

(1) Current bills and federal tax withheld from employees	$ 10,328.60
(2) Obligations for printing and distributing the 1950 Mechanical Catalog and other bills which have not been submitted	17,781.31
(3) Unexpended appropriations for future services	73,056.97
(4) Special research and other committees which have collected funds for special purposes to be expended as needed	99,532.08
(5) Future services to members who have prepaid dues	136,733.56
(6) Subscribers to publications who have prepaid	4,000.00
	$341,432.52

To meet these debts the Society had:

(1) Cash in the bank	$ 86,725.88
(2) Accounts receivable	149,751.78
(3) Inventories of publications and supplies conservatively valued at	69,021.35
(4) Securities (at the lower of cost or approximate quoted market values)	657,796.71
(5) Prepaid charges applicable to future years	2,741.68
	$966,037.40

The difference between the value held by the Society of $966,037.40 and debts of $341,432.52 is the net worth of the Society on September 30, 1949, $624,604.88, of which $500,000.00 has been set aside as a general reserve against contingencies, leaving a balance of	$124,604.88

[1] The certified report of the auditors, Price, Waterhouse & Co., is on file in the Society office and available for inspection by the members.

The Society had other liabilities:

(1) Development Fund of		$ 76,787.55
Against which it had		
(a) Cash	$ 759.55	
(b) Securities (at the lower of cost or approximate quoted market values)	71,028.00	
(c) Notes receivable	5,000.00	
	$ 76,787.55	
(2) Employees' Retirement Fund of		$ 98,234.81
Against which it had		
(a) Cash	$ 9,187.78	
(b) Securities (at the lower of cost or approximate quoted market values)	89,047.03	
	98,234.81	
(3) Trust Funds amounting to		$168,926.33
Against which the Society had the following assets:		
(a) Cash	$ 20,032.70	
(b) Securities (at the lower of cost or approximate quoted market values)	148,893.63	
	$168,926.33	
(4) Property Fund of		$554,535.79
With the following assets to support it:		
(a) Quarter interest in building	$498,448.48	
(b) Office furniture and fixtures (depreciated value)	56,085.31	
(c) Library books	1.00	
(d) Engineering Index, Inc.—Title and good will	1.00	
	$554,535.79	

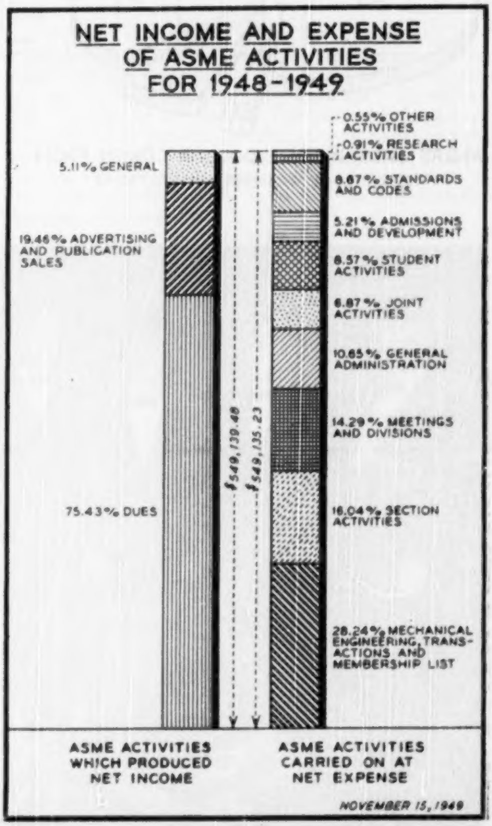
Table 3 shows the income and expense for the major groupings of Society activities. Table 4 shows the activities which produce an income and those which result in a net expense.

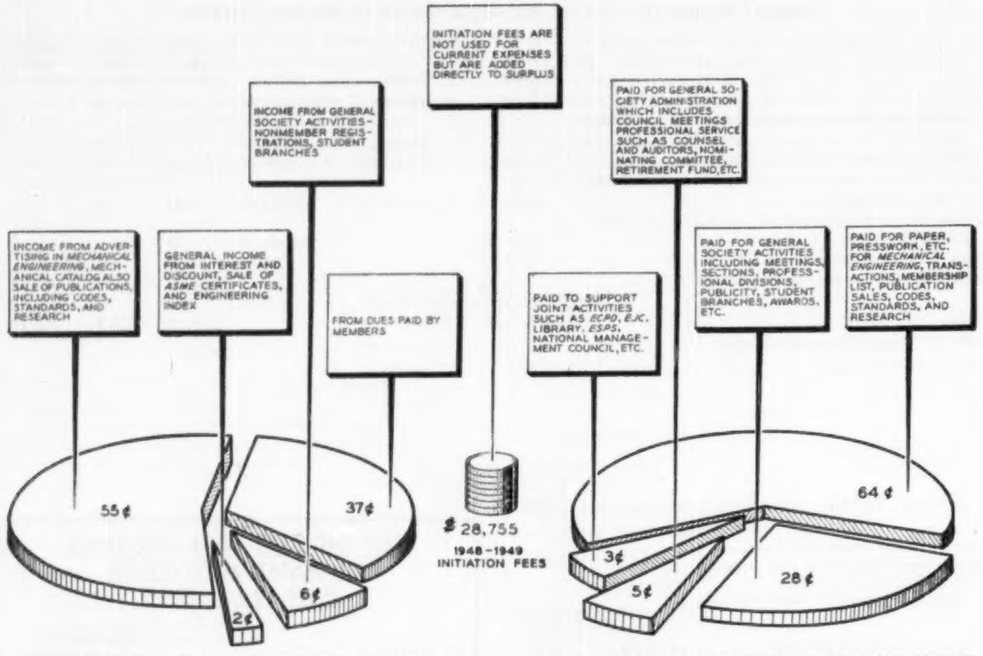
TABLE 3 INCOME AND EXPENSE FOR MAJOR GROUPS OF SOCIETY ACTIVITIES

	Expense	Income	Net	Expense per member	Income per member	Net expense per member
Dues	......	$ 414,201.86	+$414,201.86	....	$13.50	....
General income (interest, discount, emblem sales, Engineering Index)	......	28,059.97	+ 28,059.97	....	0.91	....
Publications, Standards, Codes, and Research	$ 723,774.43	622,994.39	− 100,780.04	$23.59	20.31	$ 3.28
General Society Activities (meetings, sections, student branches, admissions, etc.)	310,773.48	65,514.20	− 245,259.28	10.13	2.14	7.99
General Society Administration (Council, auditor, counsel, retirement fund)	58,472.07	......	− 58,472.07	1.91	....	1.91
Joint Activities (Library, ECPD, EJC, etc.)	37,746.19	......	− 37,746.19	1.23	....	1.23
Addition to surplus from operating income	4.25	......	......	....	....	....
Total	$1,130,770.42	$1,130,770.42		$36.86	$36.86	$14.41
Addition to surplus from initiation fees		28,755.00				
Total addition to surplus		28,759.25				

TABLE 4 INCOME AND EXPENSE OF ASME ACTIVITIES 1948–1949

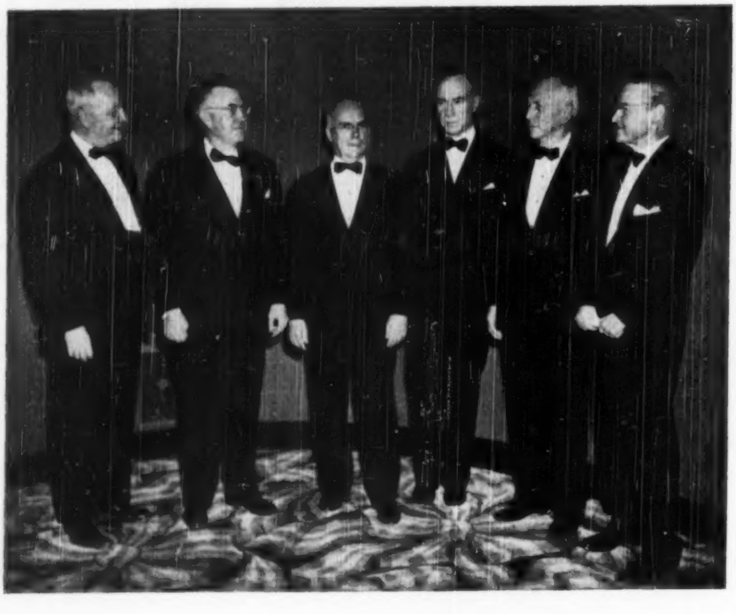
Activities Which Produce a Net Income		
MECHANICAL ENGINEERING advertising and Mechanical Catalog income	$422,562.29	
Less production costs, wages, and indirect	317,334.57	$105,227.72
General publication sales income	$ 89,486.23	
Less, stock cost, wages, and indirect	87,836.30	1,649.93
Engineering Index, Inc.		3,047.06
Miscellaneous sales		5,751.75
Interest and discount		19,261.16
Membership dues		414,201.86
Total		$549,139.48
Activities Carried on at a Net Expense		
MECHANICAL ENGINEERING text (production, wages, and indirect)		$112,851.21
Transactions (production, wages, and indirect)		38,456.05
Membership List (production, wages, and indirect)		3,747.72
Standards and Codes income	$107,555.29	
Stock cost, wages, and indirect	155,146.85	47,591.56
Research income	$ 3,390.58	
Stock cost, wages, and indirect	8,401.73	5,011.15
Student dues	$ 62,904.00	
Student expense (production, wages, and indirect)	109,978.94	47,074.94
Meetings income	2,610.20	
Costs, wages, and indirect	54,710.03	52,099.83
Sections (appropriations, travel, wages, and indirect)		88,073.48
Divisions (appropriations, wages, and indirect)		26,379.55
Admissions and development (wages and indirect)		28,610.06
Awards (cost, wages, and indirect)		1,630.63
Engineers Civic Responsibility		1,390.79
Joint Activities		37,746.19
General administration		58,472.07
Total		$549,135.23
Net Income		4.25





WHERE ASME INCOME DOLLAR COMES FROM
TOTAL INCOME 1948-1949 — $ 1,130,770.42

HOW THE ASME INCOME DOLLAR WAS SPENT
TOTAL EXPENSES 1948-1949 — $ 1,130,770.42



JAMES M. TODD, *left*, 1949 PRESIDENT OF ASME PICTURED WITH PAST PRESIDENTS AT THE 70TH ANNUAL MEETING

(*Left to right:* Mr. Todd, E. W. O'Brien, Robert M. Gates, William A. Hanley, Alex D. Bailey, and D. Robert Yarnall.)

1949 ASME ANNUAL MEETING

Extensive and Varied Program of Technical and Social Events Presented at Hotel Statler, New York, Nov. 27–Dec. 2, 1949

THE great event of the year for mechanical engineers, the Annual Meeting of The American Society of Mechanical Engineers, got under way on Sunday noon, Nov. 27, 1949, at the Hotel Statler, New York, N. Y., and ran through Friday of that week, with a total attendance of over 5000 members and guests. Sunday was devoted to meetings of the Council and a conference of Council members with representatives of the Boards, Committees, and Professional Divisions, at which discussion was directed toward means by which a better Society can be developed.

The week of this Seventieth ASME Annual Meeting was crowded with luncheons and dinners, both public and private, technical sessions, and numerous committee meetings at which technological, professional, Society, and general subjects were discussed. The program listed more than 200 papers and addresses presented by about 300 persons at more than 80 sessions. One hundred and eighty preprints were available for sale to members and guests.

At the Annual Dinner and Honors Night for members, which took place in the Ballroom on Wednesday night, an overflow attendance taxed the facilities of the balcony and the Keystone room which adjoins the Ballroom, and was unique in Society history because the speakers were the presidents in office of The Institution of Mechanical Engineers of Great Britain and The American Society of Mechanical Engineers. An extensive program devoted to the conferring of medals, prizes, and Honorary Memberships preceded the delivery of the two addresses. The addresses of the two presidents are published in this issue.

Throughout the week the women guests were entertained by an interesting program provided by the ASME Woman's Auxiliary, but the Meeting also provided a technical session designed particularly for women engineers, thus for the first time recognizing the important role which is being played by women engineers in the Society and in engineering practice. The Auxiliary also took a prominent part in the President's luncheon and entertained members and guests at a Tea Dance.

As usual, the American Rocket Society held its annual meeting simultaneously with ASME, with which it is officially affiliated.

A high point of the Seventieth Annual Meeting was the inauguration of the Roy V. Wright Lecture, with an address on "Standards of Citizenship", delivered by one of Dr. Wright's close friends and "political mentor," the Honorable Arthur T. Vanderbilt, Chief Justice of the Supreme Court of the State of New Jersey.

In the pages that follow an attempt is made to cover the high lights of the program, with the exception of the technical sessions, which, in most cases, are covered by the abstracts of papers published from month to month in this magazine as copies become available. For the convenience of readers a list of these papers, with instructions for procuring copies, is presented on pages 84–86 of this issue.

BETTER-SOCIETY CONFERENCE

On Sunday evening, before the business of the Annual Meeting was in high gear, Society leaders, represented by the members of the Council, Boards, Standing Committees, and the Executive Committees of the 20 ASME Professional Divisions, met to discuss in an off-the-record atmosphere problems of unification and engineering education.

The discussions were paced by prepared statements by five speakers who commented on recent actions of the Engineers Joint Council and the Engineers' Council for Professional Development.

President James M. Todd presided. He called on C. E. Davies, secretary ASME, who proceeded to create an atmosphere of informality and good fellowship by naming each of the more than 60 members present, a feat which he performed with skill and good humor.

Before introducing the first speaker, President Todd explained the purpose of the gathering as one of developing and exchanging ideas on how better to co-ordinate the engineering profession.

PROBLEM OF UNIFICATION

President Todd reviewed briefly the joint activities of the ASME, referring particularly to the interest among engineers in some kind of unification of the profession. The EJC on Nov. 20, 1949, he said, sponsored an exploratory conference on unification to which 16 national engineering societies were invited. Edgar J. Kates, director at large, ASME, attended the Conference as ASME representative. A brief report on this conference will be found in MECHANICAL ENGINEERING, December, 1949, page 1062.

In his account of what took place at the unification conference, Mr. Kates reported that representatives of 14 of the 16 societies were present. In a friendly atmosphere the long history of unification was reviewed. This helped to clarify three points: (1) general recognition that unification of the profession was desirable; (2) that the unifying organization or agency should maintain close ties with individual engineers; and (3) that unification should first be sought through existing agencies, such as the EJC or the National Society for Professional Engineers, before considering new organizations. As a result of more than two hours of discussion, a seven-man planning committee was appointed to prepare proposals incorporating the various ideas expressed. The planning committee met immediately after the conference and is now working up material to be presented at the next session of the group scheduled for January, 1950, he said.

Discussion of Mr. Kates's report further explored the objectives of unification which were characterized variously by speakers as co-operation and co-ordination.

PROBLEMS OF THE STUDENT BRANCHES

The problem of the confusion created on American engineering-school campuses by the operation of too many student branches of engineering societies was introduced by Paul B. Eaton, vice-president, ASME Region III. He reported on his attendance of a conference held Sept. 13, 1949, for the purpose of exploring co-ordination of student branches. The conference, called by the American Society of Civil Engineers, was attended by representatives of eight engineering societies.

The conference pointed up a difficult problem on the

James D. Cunningham

President of The American Society of Mechanical Engineers for 1950

campus, which, Professor Eaton warned, must be solved if the "sales talks" by competing engineering societies are not to confuse engineering students or to distract them from their first job, that of obtaining an engineering education. The conference adjourned without action, but will meet again in January, 1950.

The discussion following Professor Eaton's talk gave evidence of general recognition among ASME members that the campus was the primary seedbed for the ideas of unification or co-operation among engineering societies and that the ASME should continue to co-operate with other societies on the student-branch level.

UNIFORM GRADES OF MEMBERSHIP

At this point President Todd turned the chair over to Dr. Harry S. Rogers, chairman ECPD, who directed the discussion to engineering education and professional development. Dr. Rogers described briefly the purposes and organizational structure of the ECPD and some of the accomplishments of its four main committees.

He called upon A. M. Gompf, chairman, ASME Board on Membership, to discuss the ECPD project on standard membership grades sponsored by the ECPD Committee on Professional Recognition. The grades recommended by the ECPD, Mr. Gompf said, are those of Member, Associate Member, and Student Member and are in line with present ASME membership grades, except that there is a change of name from Junior Member to Associate Member. Two "optional" grades, Fellow, an honorary one to which an engineer is called, and Affiliate, are also suggested. The requirements for the Affiliate grade differ slightly from those for the present ASME Associate grade.

Mr. Gompf reported that both the ASME and the American Institute of Electrical Engineers had approved the standard grades in principle and probably will adopt them if two or more of the other Founder Societies express the same intention.

THE ENGINEERING CURRICULUM

The last of the prepared statements was made by Dean S. C. Hollister, chairman, ECPD Committee on Engineering Schools, who discussed the differentiating characteristics of the engineering curriculum. Dean Hollister said that many schools are catering to the popular demand for specialized training in a variety of engineering specialties and as a result there exists some confusion as to what really characterizes an engineer or the curriculum suitable for an engineering education. He offered the following definition of an engineer as an attempt to define those attributes which are peculiarly and exclusively those of the engineer:

"An engineer is characterized by his ability to apply creatively scientific principles to design or develop structures, machines, apparatus, or manufacturing processes, or works utilizing them singly or in combination; or to construct or operate the same with full cognizance of their design, and of the limitations of behavior imposed by such design; or to forecast their behavior under specific operating conditions, all as respects an intended function, economics of operation, and safety to life or property."

The definition was the end result of long deliberation by his committee, Dean Hollister said. He asked engineers in industry to study it and to give his committee their comments. In the discussion which followed, broad aspects of the relation of industry to education were commented upon, the consensus being that both had a responsibility for the quality of the product of the schools. Dean Hollister's report will be published in a future issue.

ASME COUNCIL MEETS

The Council of The American Society of Mechanical Engineers held its initial session on Sunday afternoon, November 27, at the Hotel Statler, New York, N. Y., and continued its deliberations on Monday morning and afternoon. President James M. Todd presided at all sessions. On Tuesday evening the 1949 and 1950 Council members met for dinner, and on Friday morning the 1950 Council held an executive session for the conduct of necessary business. Throughout these meetings the entire membership of both Councils was recorded as being in attendance. In addition to members of the Council, chairmen and members of Society Boards and Committees, and many members of the Society were present and took part in the discussions.

ELECTION OF HONORARY MEMBERS

The first business of the Council was the unanimous election to Honorary Membership of Past-Presidents Alex D. Bailey and D. Robert Yarnall. President-Elect James D. Cunningham was posted at the door of the Council room to engage the two past-presidents in conversation during the brief interval which was necessary to act on the election. Shortly after the action had been completed amid universal applause, the two newly elected Honorary Members put in their appearance and were showered with congratulations.

SOUTH AFRICAN INSTITUTION OF ENGINEERS

W. M. Sheehan, member of The Council, reported that, as an Honorary Vice-President of the Society, he had visited South Africa, and had extended the best wishes of the ASME Council and members of the Society to the South African Institution of Engineers, Johannesburg. Many courtesies had been extended to him during his stay in South Africa, he said, and the ASME Council instructed the President to express their appreciation to the Institution.

ANNUAL REPORTS

Annual reports of the Council, Boards, Committees, and representatives on joint activities were presented. The Annual Report of the Council to the Members, which will be found on pages 41-50 of this issue, was adopted; and the reports of Boards, Committees, and representatives on joint activities were accepted. These reports are available and copies may be obtained by addressing the Secretary at headquarters.

The annual report of the ASME Woman's Auxiliary was accepted in a vote expressing deep appreciation of the work of the Auxiliary.

CONSTITUTION AND BY-LAWS

A considerable portion of the time of the Council was devoted to discussion and action on various proposed changes in the Constitution and By-Laws of the Society. Amendments to Article C6, Sec. 4; C8, Sec. 2, C9, Secs. 3 and 6, which relate to the Council, officers, and meetings of the Society, and which are intended to clarify and expedite the transfer of administration which takes place at the time of the Annual Meeting, were discussed and will be submitted to the Business Meeting to be held in St. Louis, Mo., in June, 1950.

The Council approved insertion of a footnote to Article B5, Par. 9, of the By-Laws in which the rate of dues of Student Members is stated.

Considerable discussion developed over a proposed amendment to Article B5, Par. 12, which refers to the life membership conferred on any Fellow, Member, or Associate of the Society who has paid dues for thirty-five years, with the result that the amendment was referred to the Executive Committee of the Council for a consideration of the proper steps to be taken for the guidance of the Constitution and By-Laws Committee.

Adoption was voted of an amendment to Article B6A, Par. 17-B, relating to the Membership Development Committee.

Amendments to Article B7, Par. 2, relating to the Nominating Committee, and to Article B7, Par. 14, relating to the time at which the new officers of the Society shall be declared elected and the time at which the terms of office shall begin, were received for first reading.

APPLIED MECHANICS REVIEWS

The Secretary outlined briefly the history of *Applied Mechanics Reviews* and the steps that led to its establishment, and presented a statement including a three-year budget which had been prepared at the request of the Executive Committee. Extended discussion established the opinion of the Council that the project is decidedly worth while and enhances the prestige of the Society. The Council therefore voted its agreement in principle to the continuance of *Applied Mechanics Reviews*, enjoined the Applied Mechanics Reviews Managing Committee to set up a program to make it self-supporting, to make available from the ASME Development fund an amount of $15,000, if necessary, for the calendar year 1950, and to review the project in September, 1950, at which time one point of decision will be further continuation of *Reviews*. The Council also authorized the Secretary to solicit support in the amount of $2500 from The Engineering Foundation.

On recommendation of the Board on Technology, the Council

New Members of the 1949 ASME Council

Regional Vice-Presidents

S. H. GRAF

FRANK M. GUNBY

A. C. PASINI

JOHN C. REED

Directors at Large

B. P. GRAVES

T. E. PURCELL

voted to approve the efforts of the Applied Mechanics Reviews Managing Committee to solicit funds for support of *Reviews* from research and other organizations which have not contributed to the ASME Development Fund, with the understanding that any surplus over that needed to meet the expense of publication is to be contributed to the ASME Development Fund up to the amount that has been allocated from the Fund for the *Reviews* project.

On recommendation of the Board on Technology and subject to approval of the Organization Committee, the Council voted to add R. E. Peterson, J. M. Lessells, and L. Van Griffis to the Applied Mechanics Reviews Managing Committee.

On recommendation of the Board on Technology the Council authorized the appointment of a committee to study and recommend action on the desirability of a continuing Committee on Increasing the Development Fund.

NATIONAL MEETINGS

It was reported that the Board on Technology, on recommendation of the Meetings Committee, had approved the 1951 Spring Meeting to be held in Atlanta, Ga., and the 1951 Semi-Annual Meeting, to be held in Toronto, Canada.

RESEARCH COMMITTEE

On recommendation of the Research Committee, approved by the Board on Technology, the Council authorized a transfer of funds to finance staff service for the Research Committee.

NUCLEAR-ENERGY-APPLICATION COMMITTEE

The Secretary reported on the status of the Nuclear Energy Glossary and stated that publication at an early date was hopeful. Alex D. Bailey, chairman of the Nuclear-Energy-Application Committee, reported on the educational program which the Committee had suggested to the Atomic Energy Commission.

PUBLIC-RELATIONS COMMITTEE

Following a discussion of the operation and functions of the Public Relations Committee, appointed in 1947 to consider the broad program of the public relations of the Society, the Council voted to reorganize the Committee and to request the newly organized Committee to submit a preliminary program at the January meeting of the Executive Committee of the Council.

FINANCE COMMITTEE

J. H. Lawrence, chairman of the Finance Committee, reported on a meeting of the Committee with the auditors for the purpose of discussing the desirability of adopting a few recommendations that had been offered, and discussed certain safeguards in connection with the Society's participation in the Power Show.

ORGANIZATION COMMITTEE

K. H. Condit, chairman of the Organization Committee, reported that the usual scanning of committee nominations had proceeded satisfactorily, that several nominations had been sent back for reconsideration, and that an attempt was being made to stimulate the committees to select the right personnel for committee service. He reported that the Society office is being operated efficiently and that improvements are being made continually. A list of potential committee members is being prepared and is about one third completed.

BOARD ON MEMBERSHIP

For the Board on Membership, A. M. Gompf, chairman, reported discussions on the proposed ECPD uniform grades of membership. The ASME Fellow grade was discussed and decision was taken to place the subject on the agenda of the Regional Administrative Committee.

NATIONAL MANAGEMENT COUNCIL

Approval was voted of a proposed amendment to the by-laws of the National Management Council, Inc., in which ASME is a participating organization, whereby a new class of membership known as "associates" will be established.

ERIE MEETING OF THE COUNCIL

Various matters originating in the informal meeting of Council members at Erie, Sept. 29, 1949, were reported. As a result of a joint discussion with the Board on Technology at that time, which served to inform Council members of the policies and work of the Board, it was decided to invite other Boards to meet with the Council at Spring and Fall Meetings of the Society, where the informal character of the agenda affords opportunity and time for such informative discussions.

Other subjects discussed at Erie included the unification of engineering societies and the Pan-American Union of Engineering Societies, a preliminary meeting of which was held at Sao Paulo, Brazil, July 9–14, 1949. The Secretary reported that Engineers Joint Council had been working on the Pan-American problem for four years and had met with representatives from South America who presented a constitution for such a Union, known as UPADI. EJC, he said, has referred to its Committee on International Relations, for recommendation, an invitation for EJC to join other national engineering groups of the Western Hemisphere in the formation of a Union of Pan-American Societies of Engineers. The opinion was expressed that ASME representatives on EJC should be urged to support co-operation with the Pan-American Union, and the Council suggested that EJC should interest itself in the Union and keep closely in touch with it.

SECTIONS

The ASME Metropolitan Section was authorized to participate as an active member of the Technical Societies Council of New York, Inc., and the New Jersey Division as an active member of the Technical Societies Council of New Jersey, Inc.

Authorization was voted of the transfer from the Mid-Continent to the New Orleans Section of certain Louisiana Parishes.

A petition for the establishment of an ASME Section in Mexico was discussed. In accordance with an international policy which the Society is contemplating, it seemed desirable to withhold authorization of the Mexico Section. The Council voted, however, that pending the arrangement of a policy with regard to Society members in foreign countries, and subject to agreements with existing societies in such countries, the Society recognize the Mexican members as a Group, request that they designate a secretary and a chairman, and prepare operating rules.

STUDENT BRANCHES

The sum of $1000 was allotted for an increase in mileage grants for attendance of representatives at Student Conferences. The Finance Committee will determine, after conference with the vice-presidents, how this money will be allocated to the Regions.

Authorization was voted of the transfer of the Student Branch at Louisiana Polytechnic Institute, Ruston, La., from the Mid-Continent to the New Orleans Section.

Authorization was voted of the establishment of ASME Student Branches at Thayer College, Dartmouth University, Hanover, N. H., and Norwich University, Northfield, Vt.

SOLICITATION OF FUNDS

It was reported that the Executive Committee of the Council had approved, without prejudice and without establishing a precedent, solicitation of contributions from members of the ASME Management Division for the support of the National Management Council, Inc., in which ASME is a participating body. After discussion, the Council voted that in the event of a noncomponent body desiring to solicit support from interested members of the Society, a request should be prepared and submitted to the Council. Upon approval by the Council the solicitation should be made by the Society, and the monies collected are to be earmarked for contribution to the body making the request.

ENGINEERING SOCIETIES BUILDING

It was reported that the United Engineering Trustees, Inc., had under consideration a proposal to sell the Engineering Societies Building in New York, headquarters of the Founder Societies, and to purchase a more modern building. Three such buildings are available and are under consideration. Members of the Executive Committee of the Council had been canvassed and had approved the proposal provided there would be no increase in cost to ASME and the new quarters would be acceptable. The UET was so advised.

K. W. Jappe, an ASME representative on UET, summarized a communication from UET on the subject and presented five conclusions which the Council voted to accept. These conclusions are as follows:

1 If a change is desirable, the Society prefers renting to buying.

2 If the rental costs are higher, the Society may use less, rather than more, space.

3 The Society will not be a party to any project involving a mortgage.

4 The Society regards the cost of alterations of the present Engineering Societies Building as excessive and prefers deferment to a more favorable cost period, keeping the depreciation fund so invested that the principal can be secured, without loss, when needed.

5 The Society favors pushing money-raising efforts at this time for use in a favorable building-cost period.

LONDON CONFERENCE OF ENGINEERING SOCIETIES

The Secretary presented a statement on the London Conference of Representatives from the Engineering Societies of Western Europe and the United States, held in London, Sept. 19-23, 1949, in which it appears that Engineers Joint Council voted "to express the view that the American Society of Civil Engineers, The American Society of Mechanical Engineers, and the American Institute of Electrical Engineers become participating bodies in the London Conference on an individual basis in addition to their representation of EJC." The Council expressed its opinion that ASME should participate in the Conference provided parallel action is taken by ASCE and AIEE.

ENGINEERS JOINT COUNCIL

E. G. Bailey, ASME representative on Engineers Joint Council, outlined the work and status of various EJC committees. He reported that consideration is being given to a change of its name; but it was the opinion of the Council that the name should not be changed. He announced that EJC meetings are open to all members of the Council.

R. M. Gates, EJC representative on the U. S. National Committee for UNESCO, spoke briefly of the work of that body. He reported that it was the opinion of the London Conference of Engineering Societies "that it is not necessary for UNESCO at this time to concern itself with the affairs of the national engineering societies and their relations with each other."

The Council commended EJC for the work it is doing and particularly commended ASME representatives on it, and voted to take immediate steps to publicize the report on EJC activities in the form of a special bulletin to all ASME members.

LABOR LEGISLATION

W. L. Fleischmann, chairman, and R. L. Jackson, member of the executive committee, of the Schenectady Section, presented the problem of securing proper representation of the engineering profession through Engineers Joint Council at hearings on labor legislation. Members of the Council expressed the view that the matter should be studied by EJC for action at such time as it may become necessary.

ASME STAFF MEMBERS

In accordance with a procedure adopted in 1943 whereby members of the ASME staff who have served for twenty-five years and more receive recognition, the Secretary presented four such members to the Council. The Council extended to Mae R. Lenen, Edna M. Murrayes, and Joseph M. Clark, members of the staff for 30 years, and to Florence M. Schonger, member of the staff for 25 years, sincere appreciation for their loyal services and contributions to the work of the Society.

The Secretary introduced four new members of the ASME staff to the Council: Mrs. Dorothy M. Shackelford, Lee P. Tolman and John H. Deppeler, of the Standards Department, and E. H. Anderson of the Meetings Department.

MEMBERS OVERSEAS

The Council voted to refer to the Board on Public Affairs, for review and study, the Society policy on dues of members in foreign countries.

FRANCIS HODGKINSON

The Council noted with regret the death, on Nov. 4, 1949, of Francis Hodgkinson, Honorary Member.

APPOINTMENT OF SECRETARY AND TREASURER

At a brief meeting of the 1950 Council, held at the Hotel Statler on Friday morning, December 2, C. E. Davies was reappointed Secretary of the Society.

Because K. W. Jappe had signified his desire not to be reappointed as treasurer, the Council elected J. L. Kopf treasurer, and Edgar J. Kates assistant treasurer of the Society.

The Executive Committee of the Council for 1950 will be constituted as follows: James D. Cunningham, chairman; Frederick S. Blackall, Jr., Forrest Nagler, A. C. Pasini, and Ralph A. Sherman.

1949 ASME ANNUAL BUSINESS MEETING

At five o'clock on Monday, November 28, in the Keystone Room of the Hotel Statler, New York, N. Y., President James M. Todd called to order the 1949 Annual Business Meeting of The American Society of Mechanical Engineers.

C. E. Davies, secretary of the Society, summarized the Annual Report of the Council to ASME Members and J. H. Lawrence, chairman of the Finance Committee, presented the financial report (see pages 48-50). Mr. Lawrence said that the Society had ended its fiscal year, Sept. 30, 1949, with $4.25 of income in excess of expense, after adding $28,755 to surplus. The year had produced the largest income in history $1,130,770.42; and had shown the highest revenue from advertising on record, $422,562.29. From a membership at a new high of 30,680 there had been collected dues in the amount of $414,201.86; and from the largest student membership in history, dues amounting to $62,904.

Mr. Davies entered into the record the names and addresses of members who had joined the Society during the year and the names of members who had died during the year. He also entered into the record statements required by the Constitution and the statutes.

On motion from the floor, actions of the Council during the year were approved.

Mr. Todd announced the officers of the Society elected by letter ballot of the members and introduced each new officer, as follows: T. E. Purcell and B. P. Graves, directors; F. M. Gunby, J. C. Reed, A. C. Pasini, and S. H. Graf, vice-presidents; and James D. Cunningham, president. Biographical sketches of these new officers will be found on pages 786-788 of the September, 1949, issue of MECHANICAL ENGINEERING.

A resolution relating to the age at which a member may become dues exempt was presented, discussed, and failed of adoption.

PRESIDENTS' LUNCHEON

The initial social event of the 1949 ASME Annual Meeting was the Presidents' Luncheon, held in the Ballroom of the Hotel Statler, New York, N. Y., on Monday noon, November 28. President James M. Todd presided.

The Presidents' Luncheon represented an innovation on ASME Annual Meeting programs. It was instituted to provide a setting for the members of the Woman's Auxiliary of ASME, and of the Society to join together in good fellowship.

Mrs. Randall B. Purdy, president of the ASME Woman's Auxiliary, was introduced by President Todd and spoke briefly on behalf of her organization. She said that she considered it a privilege to be invited to address the luncheon and that she appreciated the honor of representing that organization at the Presidents' Luncheon. She extended a welcome to all the women who were attending the Annual Meeting and pledged her support to make their visit to New York a pleasant one. The Woman's Auxiliary had been growing, she announced, and now had sections in communities extending from coast to coast. She called attention to the scholarship for a foreign student which the Auxiliary supports, and to the revolving loan fund which it administers for the aid of needy mechanical-engineering students.

DR. GILBRETH ADDRESSES PRESIDENTS' LUNCHEON

The principal speaker at the Presidents' Luncheon, Dr. Lillian M. Gilbreth, Fellow ASME, and president, Gilbreth, Inc., Montclair, N. J., was introduced by Mr. Todd with gracious tributes to her career and her achievements. Dr. Gilbreth's address bore the title, "What Is Human Engineering?"

UTILIZE RESOURCES OF SPIRIT

Dr. Gilbreth said engineers must utilize the resources that come from learning from, and working with, "those who know most of the ways in which the human body, mind, and spirit function." Although it is true that the engineer has not often the technical training in the sciences that concern themselves with the human being, she said, he is learning something of their content and also learning to co-operate with the sociologists, psychologists, psychiatrists, and the others who work in these fields.

"As he evaluates them and their work he applies the same measuring sticks that he applies in his profession," said Dr. Gilbreth. "Are they concerned with facts? Are they developing and using accurate measurements? Are they separating their findings from their hypotheses and their hopes? He also asks if they are concerning themselves with the human being working with the forces of nature, what do they know of the operation of these forces?"

Dr. Gilbreth said engineers do not like the term, human engineering, "do not use the term, are suspicious of it and of those who use it."

"If they could legislate it away it seems likely they would do so," she declared. "Their experiences with nonengineering groups who call themselves engineers have been unfortunate. They have not only proven themselves unable to do work of higher caliber, but they have also shaken the public faith in the scientific validity of the work they call engineering."

CONCERNED WITH PEOPLE

Dr. Gilbreth found fault with the "usual definition of the term: 'the handling of problems related to the people in the same way that the engineer handles problems related to things.'

"This at once exposes the fact that the user of this inadequate definition does not realize that the engineer concerns himself with people as well as things," she said, adding that the official definition of the engineering profession is: "the art of organizing and directing men and of controlling forces and materials of nature for the benefit of the human race."

"Note," she emphasized, "that this describes an art, based on a science or sciences, which utilizes men and nature for the good of mankind.

"What does this imply? First, the engineer is a scientist, a fact finder who is trained to observe, to record, to face, to use, and to abide by facts. He has submitted to the disciplines of the scientific process. He is by tradition, by training, by the acceptance of codes, committed to the scientific method. When he studies, plans for, directs the human element, he uses the same disciplined scientific procedure that he uses when he concerns himself with the forces of nature. On his job he concerns himself with both and learns to understand the effect of each on the other, to develop means of combining the two."

ENGINEER MUST DO THE JOB

If human engineering is anything, she declared, it is the application of engineering principles and techniques to the study and direction of people. "And if there is to be human engineering, it is the engineer who must do the job," said Dr. Gilbreth. "If people of other types of training are to do it, they should not be called engineers."

DR. LILLIAN M. GILBRETH AND PRESIDENT TODD AT THE PRESIDENT'S LUNCHEON

Undoubtedly there is much the engineer can learn from the social scientists, she said.

"If life were longer and time were available, it would be of great advantage to the engineer to be as thoroughly trained in the social sciences as he is in the exact sciences. By stating that he directs and organizes men he implies that he knows how to do this work. This implies that he understands what makes men capable of being organized and directed. They must be able and capable and willing to be organized and led—and the engineer must be able and capable and willing to do the job.

JOB RELATIONS

"Fortunately we are coming to realize that understanding people is a part of every job and a part of all job relations. Knowing oneself; knowing likenesses and differences between people; understanding the motivation that influences them; the physical, mental, emotional, social traits that constitute them; the arts of communication that enable them to get their ideas and feelings across effectively to each other—these are all a part of necessary training for everyone."

For his own sake, for his profession's sake, for the work's sake, for the world's sake, the engineer must make his profession stand for what the definition that he himself formulated implies, she declared, adding that the result of this is bound to contribute to the last part of his definition, "the benefit of the human race."

PRESENTATION OF CERTIFICATE

When Dr. Gilbreth had completed her address, J. Keith Louden, chairman of the ASME Management Division, presented her a framed certificate on behalf of the Division and read the citation which it contained.

WOMEN AS ENGINEERS

At the close of the Presidents' Luncheon, and carrying out the spirit of that occasion, which was to pay tribute to the part played by the ASME Woman's Auxiliary and to the women members of the Society who are engaged in engineering, the Education Committee sponsored a session under the chairman-

ship of Ralph L. Goetzenberger, member ASME, and vice-president, Minneapolis-Honeywell Regulator Co., Washington, D. C.

Herbert Barnhardt, project director, Raymond Lowey Associates, New York, N. Y., presented a paper entitled "Designing for Women." He was followed by Mrs. Florence F. Buckland, member ASME, General Engineering and Consulting Laboratory, General Electric Company, Schenectady, N. Y., who spoke on "Engineering as a Profession for Women."

Mrs. Buckland said if it is a fact that women engineers are "a little queer," the blame belongs to the educators. She accused them of putting "obstacles in the path of a woman acquiring an engineering education."

"They do not realize how interesting engineering can be to women if its fundamentals are presented from the feminine point of view," she said. "Such training as is offered is based on strictly masculine considerations, and it is not surprising that most women find it hard to become interested in what looks like man's work. Women who become engineers do so because of a deep interest in the phenomena of the physical world, or at least in the physical world that embodies their experience. They are willing to learn whatever techniques are necessary, however presented, to understand that world.

RIDING FOR A FALL

"In order to obtain a clear view of engineering as a profession for women, it is necessary to clear away some of the underbrush surrounding women in any profession or activity other than being wife and mother. To ignore the primary reason for woman being made out of one of Adam's ribs is to ride for a fall. So if one expects to find that engineering as a profession for women leads to a long, honorable, and solitary career, he is setting his sights on a biological anomaly, and only the exceptional woman engineer will be his target. Then what about the run-of-the-mill woman, who has an interest in engineering matters, but an even more pressing interest in the masculine expositor of these matters? She will always make the right choice if she puts her femininity first and her engineering second.

"If enough of the underbrush has been cleared away to show that engineering as a profession must necessarily be second to woman's chief interest, what is then left? Here is the heart of the whole matter. There is left a woman of some leisure with a trained mind, who can bring her engineering training to bear on household problems, on community problems, on national problems. Humanities or no humanities, she is a most useful member of society because of her engineering background."

Mrs. Buckland said a glance at the educational system would give an answer to why there are not more girls in the engineering colleges.

"In grammar school, boys and girls do arithmetic together, and do it equally well," she said. "In high school, the college preparatory courses offer several options, and girls are prone to select the option with the least mathematics and science. The fault is not with the girls, but with the courses. Physics courses are based on hammers and nails and puppy dogs' tails, and not on sugar and spice and everything nice.

OPTICS AND MOONLIGHT

"The physical world is just as fascinating if presented with the feminine viewpoint in mind, but this has apparently not occurred to the textbook writers. Boys and girls have essentially different backgrounds, but they do live in the same world, and they do observe the same phenomena. The tale of Newton and the apple, however apocryphal, appeals to boys and girls alike, and both are willing to translate the story into $s = \frac{1}{2}gt^2$. Discussion of the properties of matter could easily include the density of a cake of Roger and Gallet soap rather than a chunk of iron. Electricity, heat, and optics might be explained in terms of sewing-machine motors, cooking, and moonlight. There is no limit to the possibilities of giving engineering understanding to girls if the teacher talks in terms that are thoroughly familiar to them.

"The same basic difficulty pursues the girls through the engineering colleges. The analysis of any fundamental process leads to mathematical equations, which are thereafter useful for the many applications of the principle. Arriving at the equations needs thought in terms of physical processes, and subsequent use again needs translation back into physical concepts. The processes and concepts in general use have a strictly masculine background, so that the girl needs to translate again into her own feminine background."

The G. E. consultant said opportunities for women in engineering are numerous but not as numerous as they would be if their training had been set in a feminine frame of reference.

"The only stumbling block might be that her prospective employer, observing her prepossessing attributes, might think that she would not be with him long and so be reluctant to entrust her with a long-time job," she said. "To overcome this handicap she must be very sure that his firm is offering the kind of work that appeals to her and interests her, and to which she hopes to make a real contribution. Then all she has to do is to talk him into giving her the job. From then on the opportunity is there, only limited by her native ability. If she makes the most of the opportunity, it will take a really fine man to woo her away from her profession, and that is what she deserves."

THE ROY V. WRIGHT LECTURE

Before a large and distinguished audience in the Ballroom of the Hotel Statler, New York, N. Y., on Tuesday, November 29, at 5:15 p.m., the Roy V. Wright Lecture of The American Society of Mechanical Engineers was appropriately inaugurated. James M. Todd, president ASME, presided.

The Roy V. Wright Lecture was established as a tribute to Dr. Wright's participation as a citizen in the affairs of his community and in recognition of the stimulus his speeches and leadership gave to participation by all engineers in civic affairs.

Dr. Wright, who was a past-president and Honorary Member of ASME, and until his death the active leader of the ASME Engineers Civic Responsibility Committee, wrote many papers

F. A. FAVILLE (*left*) CHAIRMAN, ASME ENGINEERS CIVIC RESPONSIBILITY COMMITTEE WITH A. R. CULLIMORE (*center*) AND JUDGE ARTHUR T. VANDERBILT JUST BEFORE HE DELIVERED THE FIRST ROY V. WRIGHT MEMORIAL LECTURE

on the engineer as a citizen for MECHANICAL ENGINEERING, and was called upon by organizations all over the nation for inspirational and practical addresses on the subject. His intense interest in people and his active services to all organizations with which he was connected led him to take a leading part in the community in which he lived. He recognized that in order to be an effective influence in political life he must start at the bottom and work his way up in his political party. This he did, and eventually he was elected a senator in the legislature of the State of New Jersey. During his long and distinguished political career he worked tirelessly in engineering organizations to inspire others to assume more than the minimum responsibilities of citizenship and thus become influences for good in their communities and in the nation.

DR. CULLIMORE INTRODUCES JUDGE VANDERBILT

The purpose of the Roy V. Wright Lectureship was explained to the audience that assembled on Tuesday afternoon by Allan R. Cullimore, president emeritus of the Newark College of Engineering. Dr. Cullimore told how he had met Dr. Wright on a train en route from the Century of Progress Exposition in Chicago, and how Dr. Wright had interested him in doing something to bring to the attention of young men and engineers the responsibilities that rested on them as loyal and useful citizens. As a result of this conversation a close friendship had sprung up and Dr. Wright consented to lecture on the subject at the Newark College of Engineering. In his turn Dr. Cullimore became a member of the ASME Engineers Civic Responsibility Committee and assisted Dr. Wright in that pioneering work.

In introducing the first Roy V. Wright Lecturer, the Honorable Arthur T. Vanderbilt, Dr. Cullimore referred to the close association that existed between Dr. Wright and Judge Vanderbilt. He extolled the services rendered the State of New Jersey by Judge Vanderbilt and touched briefly upon some of them. Judge Vanderbilt, he said, was the Chief Justice of the Supreme Court of New Jersey, the former president of the American Bar Association, and dean emeritus of New York University Law School.

Judge Vanderbilt delighted his audience not only by his tribute to Dr. Wright, but by his clear presentation of the "Standards of Citizenship," the title of his address. It is hoped that the substance of this address, which was delivered extemporaneously, will be available for publication in a later issue of MECHANICAL ENGINEERING.

Following the lecture a dinner in honor of Judge Vanderbilt was held at the Hotel Statler, and was attended by a host of his friends and by friends and admirers of Dr. Wright.

ANNUAL DINNER

Some 1300 members and guests of The American Society of Mechanical Engineers witnessed the colorful ceremonies held in the ballroom of the Hotel Statler, December 1, during which the Society conferred honors and awards on distinguished members of the profession, on young men who had demonstrated proficiency in their chosen work, and the great leaders whose contributions have added something of value to American life.

In contrast to the earnestness which characterizes the working phases of an engineering meeting, honors night at an ASME Annual Meeting is the climactic interlude betweene tchnical sessions. It is an evening when business suits with their pockets stuffed with preprints, notes, and scraps of technical sketches give way to the glamour of evening dress and the glitter of colorful gowns, and when a new order of decorum dominates the meeting rooms. It is an evening of fun and good fellowship in which members take pleasure in sharing with their families pride in the achievement of their profession.

As part of the program the Society hails its president-elect, and its new vice-presidents and directors at large, honors its new 50-year members, and the recipients of honors and awards, and hears an address by a distinguished engineer, and a message from the retiring president. This year for the first time in its history the Society was honored by the presence of the president-in-office of The Institution of Mechanical Engineers.

William A. Hanley, Fellow and past-president ASME, was toastmaster. After dinner was served, he tapped his gavel, silenced the ballroom, and commenced the honors ceremonies. With him on the dais were President H. J. Gough, of The Institution of Mechanical Engineers, President James M. Todd, President-Elect James D. Cunningham, Edward P. Warner, 1950 Guggenheim Medalist, other recipients of honors and awards, and honored guests.

Mr. Hanley extended a welcome to distinguished guests from foreign countries and officers of the United Engineering Trustees, Engineers' Council for Professional Development, the Engineers Joint Council, and sister societies, who were asked to rise and receive the applause of the audience.

"On the occasion of the Annual Meeting the Society honors members who during the past year have completed 50 years of membership in the ASME," Mr. Hanley said. He introduced Orrie P. Cummings, Alfred E. Forstall, Russell W. Hargrave, Frederick D. Herbert, and Lieut. Arthur H. Hutchinson, the grandson and namesake of A. H. Hutchinson of Atlanta, Ga., who could not be present, and asked them to come forward to receive the 50-year membership badge. He then read the names of other 50-year members being honored this year and explained that similar badges would be presented to them at ceremonies in their own communities. These members were: Charles A. Alexander, John L. Bacon, William P. Caine, Lee S. Chadwick, Edward C. DeWolfe, Byron E. Eldred, Frederick J. Emeny, Hardy S. Ferguson, Harry V. Haight, Dio L. Holbrook, Samuel Hollingsworth, James F. Hunter, Clarence E. Kinne, Kwong Yung Kwang, Albert M. Price, John Joseph Swan, Perley S. Wilcox, and William R. Wilson.

HONORS AND AWARDS

Turning next to the presentation of honors and awards, Mr. Hanley explained that the following student-member and junior awards would be presented at the Members and Students Luncheon, on Thursday, Dec. 2:

Undergraduate Student Award to George D. Lewis (University of Connecticut) for his paper, "Some Natural Limitations on Space Travel."

Postgraduate Student Award to Daniel R. Fisher (Rensselaer Polytechnic Institute) for his paper "The Effect of Evaporative Cooling on a Compressible Fluid Flowing in a Duct."

Charles T. Main Award to Stanley M. Kovacheff (University of Detroit) for his paper, "The Increasing Importance of Science in Engineering."

Mr. Hanley then introduced Arthur Clinton Spurr, president of the Monongahela Power Company, Fairmont, W. Va., recipient of the 1949 Gantt Medal at a ceremony which took place during the management luncheon earlier during the day. Mr. Spurr received the medal in recognition "of his leadership in welding the resources of the community into a dynamic force that has revitalized the social and economic life of his area" served by his company.

To aid in the bestowal of the other awards, Mr. Hanley called upon Ely C. Hutchinson, Fellow ASME, to read the citations, and upon Eugene W. O'Brien, past-president ASME, and Ernest Hopping, member of the Board on Honors, to serve

JAMES M. TODD (*left*) PRESIDENT OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, PRESENTING A CHECK, THE ALFRED NOBLE PRIZE, TO JOHN C. FISHER, RESEARCH ASSOCIATE, GENERAL ELECTRIC RESEARCH LABORATORY, SCHENECTADY, N. Y., FOR HIS PAPER "ANISOTROPIC PLASTIC FLOW"

THE MELVILLE PRIZE MEDAL FOR "THE BEST ORIGINAL PAPER OR THESIS ON ANY MECHANICAL ENGINEERING SUBJECT PRESENTED BEFORE THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS DURING THE PREVIOUS YEAR"

(Presented at the Society's 70th Annual Meeting in the Hotel Statler to Harold B. Maynard (*right*), founder and president of the Methods Engineering Council, Pittsburgh, by James M. Todd, ASME president.)

BURGESS H. JENNINGS (*center*) HEAD OF THE DEPARTMENT OF MECHANICAL ENGINEERING, NORTHWESTERN UNIVERSITY, EVANSTON, ILL., PRESIDENT OF PI TAU SIGMA, ENGINEERING FRATERNITY, PRESENTING THE PI TAU SIGMA GOLD MEDAL FOR "OUTSTANDING ACHIEVEMENT IN MECHANICAL ENGINEERING WITHIN TEN YEARS AFTER GRADUATION" TO PHILLIP S. MYERS (*left*) ASSISTANT PROFESSOR OF MECHANICAL ENGINEERING, UNIVERSITY OF WISCONSIN

(Looking on is Arthur M. Wahl, advisory engineer, Westinghouse research laboratories, East Pittsburgh, Pa., recipient of the Richards Memorial Award for "Outstanding Achievement in Mechanical Engineering Within 20 to 25 Years After Graduation." The Presentations were made at the ASME 70th Annual Meeting in the Hotel Statler, New York.)

as marshals. As the awards were announced the marshals escorted the recipients to the center of the dais where the citations were read and each received from the President such certificates or medals as the awards provided. The following awards were presented:

The Alfred Noble Prize for 1949 to John Crocker Fisher, research associate, General Electric Research Laboratories, Schenectady, N. Y., for his paper, "Anisotropic Plastic Flow." The award is made each year to an engineer under 31 years of age who is an author of a paper of exceptional merit accepted for publication by any of the following societies: American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, American Institute of Electrical Engineers, or the Western Society of Engineers. The award consists of a check and a certificate.

Pi Tau Sigma Gold Medal to Phillip S. Myers, assistant professor of mechanical engineering, University of Wisconsin, Madison, Wis., for outstanding achievement in mechanical engineering. The award is made by Pi Tau Sigma, honorary mechanical-engineering fraternity, to recognize achievements by engineering graduates less than 10 years out of school and under 35 years of age.

The Richards Award for 1949 to Arthur M. Wahl, advisory engineer, Research Laboratory, Westinghouse Electric Corporation, East Pittsburgh, Pa., for noteworthy achievement in mechanical engineering 20 to 25 years after graduation. The award was established in 1944 by Pi Tau Sigma and was being awarded for the second time.

The Melville Medal for original work to Harold Bright Maynard, member ASME, and president, Methods Engineering Council, Pittsburgh, Pa., for his paper, "The Role of Scientific Management in World Recovery." The Medal is awarded annually to distinguished leaders of engineering thought.

THE ASME MEDAL FOR DISTINGUISHED SERVICE IN ENGINEERING

Fred L. Dornbrook (*right*) general consultant, power-plant department, Wisconsin Electric Power Co., Milwaukee, receives the ASME Medal, highest honor of The American Society of Mechanical Engineers, for "outstanding engineering in the research, design, and operation of pulverized-fuel combustion equipment." The medal is being presented by J. M. Todd, ASME President, at the Society's Annual Meeting in the Hotel Statler, New York

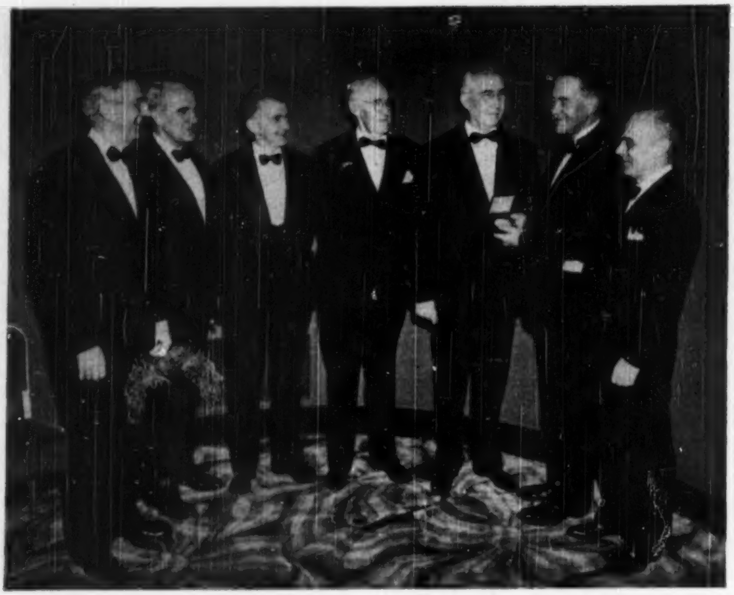
THE WORCESTER REED WARNER MEDAL IS PRESENTED TO FRED B. SEELY (*right*) HEAD OF THE DEPARTMENT OF THEORETICAL AND APPLIED MECHANICS AT THE UNIVERSITY OF ILLINOIS, URBANA, BY JAMES M. TODD, ASME PRESIDENT

The Worcester Reed Warner Medal to Fred B. Seely, professor of theoretical and applied mechanics, University of Illinois, Chicago, Ill. "for his clear interpretation of engineering concepts in theoretical and applied mechanics through inspired teaching." This award is conferred annually for noteworthy contributions to the permanent literature of engineering. Professor Seely's textbooks on mechanics and materials have had a profound influence on the development of young engineers for more than 25 years.

The ASME Medal to Fred Ludwig Dornbrook of the Wisconsin Electric Power Company, Milwaukee, Wis., for his contributions to the "burning of pulverized coal for the generation of steam" and for his fundamental "contributions through untiring effort in the pioneer development, design, and operation of pulverized-coal-fired power-generating plants."

HONORARY MEMBERS

Proceeding to the Honorary Members, Mr. Hanley explained that the Constitution of the Society provides that each year the Society may honor as many as five persons of acknowledged professional eminence for elevation to the honorary grade. This year the engineers so honored were: Alex Davison Bailey, past-president ASME and vice-president, The Commonwealth Edison Company, Chicago, Ill.; Samuel William Dudley, Fellow ASME, and dean-emeritus of the School of Engineering, Yale University, New Haven, Conn., Roy Cummings Muir, Fellow ASME, recently retired vice-president, General Electric



PIONEERING IN THE ART AND SCIENCE OF AERONAUTICS

(Edward P. Warner, *second from right*, president of the Council, International Civil Aviation Organizations, Montreal, Quebec, Canada, receives the Daniel Guggenheim Medal for his pioneering research and a continuous record of contribution to the art of science of aeronautics, from Glenn L. Martin, *third from right*, chairman of the board of the Glenn L. Martin Co., Baltimore, Md., chairman of the Daniel Guggenheim Medal Board of Award. *Left to right*, at the 70th Annual Meeting of The American Society of Mechanical Engineers in the Hotel Statler, are: Robert B. Lea, chairman of the ASME Air Cargo Program and assistant to the president, Sperry Corp., John H. R. Arms, secretary of the Daniel Guggenheim Medal Board of Award, Preston R. Bassett, past-president of the Institute of Aeronautical Sciences, L. D. Gardner, former recipient of the Daniel Guggenheim Medal and one of the founders of the IAS, G. L. Martin, E. P. Warner, and Lieut. Gen. James Doolittle.)

Company, Schenectady, N. Y.; David Robert Yarnall, past-president ASME, and president of the Yarnall Waring Company and James G. Biddle Company, both of Philadelphia, Pa., and Oliver Vaughan Snell Bulleid, consulting mechanical engineer to the Irish Transport Undertaking of Dublin, Ireland. Mr. Bulleid was not present, Mr. Hanley stated, but would receive his certificate at a later meeting.

DANIEL GUGGENHEIM MEDAL

This year the Society had the honor of presenting at its Annual Meeting the Daniel Guggenheim Medal for 1949 to one of its distinguished members, Edward P. Warner, director, International Civilian Aviation Organization. The award is made annually for notable achievements in the advancement of aeronautics to a recipient selected by a board made up of the representatives of the Society of Automotive Engineers, the Institute of the Aeronautical Sciences, and the ASME. The presentation was made by Glenn L. Martin, 1940 recipient of the medal.

NEW OFFICERS INTRODUCED

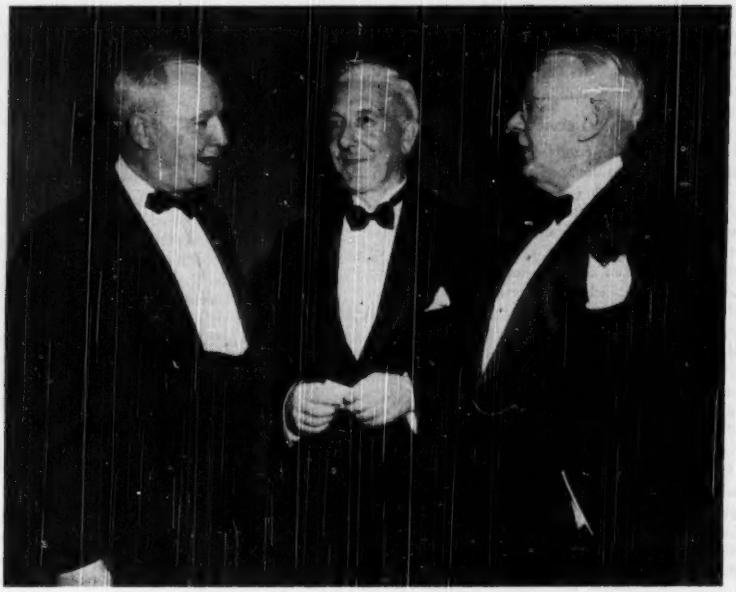
Following the presentation of the honors and awards, Mr. Hanley introduced the newly elected members of the Council and the President-elect, and announced that they would take office at the close of the Annual Meeting. The new officers were asked to stand and receive the applause of the audience.

"Tonight is an occasion unique in ASME history," Mr. Hanley continued. "For the first time we have on the same program at our Annual Meeting the presidents of the two great mechanical-engineering societies of the world." With this introduction, he called Dr. Herbert J. Gough, president of The Institution of Mechanical Engineers, and engineer in chief of Messrs. Lever Brothers and Unilever, Ltd., to the center of the dais.

Before proceeding with his address, "May We Co-Operate," Dr. Gough conveyed greetings of his Institution and expressed personal pleasure for the warm welcome accorded him and the opportunity to address the ASME.

In his work, Dr. Gough said, the engineer is concerned with the future, with the creation of new things and methods of managing materials and processes, but it is from a knowledge of the past that he profits, derives inspiration, and takes pride in great work of his predecessors. From his reading of the history of his own Institution and that of the ASME, Dr. Gough recalled that he was struck by the parallelism in the structure and achievements of the two institutions. Organized first by Sections, the two societies created professional divisions as the art of mechanical engineering developed, and directed their efforts first to national objectives, and more recently to the international ones. The founders of both societies created a force which has transcended their prime objectives and raised mechanical engineering to the dignity of a high profession.

Reviewing briefly the history of the two organizations and listing the great names in mechanical engineering on "both



ANGLO-AMERICAN ENGINEERING UNITY

(At the 70th Annual Meeting of The American Society of Mechanical Engineers in the Hotel Statler, New York, *left to right*, James M. Todd, ASME 1949 president, Dr. H. J. Gough, president of the British Institution of Mechanical Engineers, and James D. Cunningham, president, Republic Flow Meters Co. of Chicago, who will succeed Mr. Todd as ASME president in 1950.)

sides of the pond," Dr. Gough expressed the need for co-operation in the technical activities of the two societies. He referred particularly to research which can no longer remain the pursuit of one man alone in a laboratory, the results of which he announces only after conclusions have been drawn and the project completed. There was benefit in discussion of research as it progresses, in meetings of mechanical engineers of both countries, in a continual exchange of ideas in the spirit of a "brotherhood of engineers."

HISTORIC OCCASION

In his response to Dr. Gough's rhetorical question President Todd referred again to the auspicious circumstances of Dr. Gough's presence which made the 70th Annual Meeting of the ASME an historic one. For the first time in history, he said, The Institution of Mechanical Engineers was represented at an ASME Annual Meeting by its President. The time was ripe for co-operation. President Todd expressed the pleasure and gratitude of the Society for the honor of Dr. Gough's presence, and the profound conviction among American engineers that they must co-operate with engineers of the world. These, he said, were "no idle words."

Co-operation was necessary, President Todd continued, if engineering contributions to a peaceful world were to aid the material progress of civilization. Warning that "history is full of the failure of nations to keep the peace by force," President Todd urged the United States not to plan a peacetime program built primarily on military strength. He asked American engineers to give the rest of the world the necessary inspiration to struggle toward a higher-level standard of living.

Engineering accomplishments of the future, President Todd declared, like those of the past would be possible only under a peacetime economy. No wartime advancement under Government control has ever been accomplished without a previous period of research under the impetus of "profit progress"—the incentive of profitable business activities.

The addresses by Dr. Gough and President Todd will be found in this issue, pages 3–7.

At the conclusion of President Todd's talk Mr. Hanley closed the dinner meeting, after which a reception was tendered to the Presidents and their wives. Dancing followed in the Georgian Room.

DINNERS AND LUNCHEONS

DONALD F. WARNER HONORED

Donald F. Warner, the engineer who was responsible for the development of the first American jet engine, was honored by 300 engineers of the gas-turbine and aviation industry at a luncheon, Tuesday, November 29, sponsored by the ASME Gas Turbine Power Division in co-operation with the Aviation, Power, and Industrial Instruments and Regulators Divisions of The American Society of Mechanical Engineers, American Rocket Society, Institute of the Aeronautical Sciences, and the Society of Automotive Engineers.

Mr. Warner received the second annual award of the ASME Gas Turbine Power Division in recognition of his contributions and those of his associates "to the progress of the jet-engine industry in its early days ... under conditions of abnormal pressure" and for achievements which "set the pattern for the aircraft jet-engine industry." In accepting the award, Mr. Warner spoke briefly, paying tribute to his associates whose devotion and creative skills were responsible for the results achieved.

J. K. Salisbury, chairman, ASME Gas Turbine Power Division, who presented the award to Mr. Warner, told in his introductory remarks how General Electric Company late in 1941 secretly undertook the redesign and further development of Britain's Whittle engine at the request of Gen. H. H. Arnold. A group of engineers under Mr. Warner's direction set to work on a day-and-night schedule in a closely guarded building at the River Works, Lynn, Mass. The result of their work was the I-A engines which powered the flight of the first American jet plane, the Bell XP-5, on Oct. 2, 1949.

Following the presentation, Hugh L. Dryden, director, National Advisory Committee of Aeronautics, spoke on aviation as an instrument of peace. The engineer's concept of peace, Dr. Dryden said, was not one of quiet, or tranquility, or calm, or repose, as peace is defined in the dictionary, but one of "turning wheels" and of a beehive of industrial activity. In this type of dynamic peaceful world, aviation was but an instrument and a tool of the human race, he stated.

While the invention of tools has had a profound effect on human life, tools are in themselves only inanimate devices. The tool does not determine its tasks, he said. Whether it is applied to good or evil, to peace or war, is determined by men.

As a tool of peace, aviation has proved to be versatile and powerful, Dr. Dryden continued. Its most important quality was that of speed. Second was its ability to remove natural barriers. People of different customs and traditions were brought into intimate contact by it. Skillful use of aviation could help to develop mutual understanding and to disseminate more widely the benefits of human knowledge and industrial skills.

Reviewing briefly the history of aviation in the service of mankind, Dr. Dryden listed, in addition to its use as transport for persons and cargo, its application to aerial surveying, crop reporting, flood control, geological and archeological prospecting, town planning, insect extermination, and sea-rescue work.

Used as an instrument of foreign policy, aviation can serve the cause of world peace much as the revolver and club of the policeman serve as the instruments of peace in the community.

Dr. Dryden said he firmly believed that the United States would never start a war but she must build long-range bombers and atomic bombs as the best way of preserving peace and keeping her people free.

"Having tried the road of disarmament once, many responsible and thoughtful persons believe that it is safer for our nation to try the road of strength and especially to develop and maintain air power. The lesson of World War II is clear—we must not, we cannot permit ourselves to become a second best in air power if we wish to survive as a free people."

The complete text of Dr. Dryden's address will appear in a later issue.

HEAT-TRANSFER LUNCHEON

Attendance at the luncheon of the Heat Transfer Division, which was held on Tuesday noon, November 29, overtaxed the capacity of Parlor 1. L. B. Schueler, member ASME, American Gas and Electric Service Corporation, New York, N. Y., presided, and sitting with him at the head table were members of the executive committee of the Division.

At the conclusion of the luncheon the tables were removed in order to make room for the large number of persons who wished to hear the address. H. C. Hottel, member ASME, professor at the Massachusetts Institute of Technology, Cambridge, Mass., spoke on "Uses of Solar Radiation."

MATERIALS-HANDLING LUNCHEON

On Thursday members of the Heat Transfer Division met together for luncheon. H. C. Keller, member ASME, engineering manager, Lamson Corporation, Syracuse, N. Y., presided.

APPLIED-MECHANICS DINNER

About 85 members of the ASME Applied Mechanics Division attended the annual dinner of the Division which was held at the Hotel Statler, New York, N. Y., on Tuesday evening, November 29. Martin Goland, chairman of the Division, presided.

In his address of welcome, Mr. Goland announced that Dr. H. J. Gough, president, The Institution of Mechanical Engineers, Great Britain, who had consented to address the Division on "Steels Under Combined Cyclic and Static Flexural and Torsional Stresses," based on his inaugural address as President of the Institution, had been delayed by fog and would not arrive in the United States in time to meet his engagement.

Members of the Division were addressed informally by Prof. J. M. Lessells, editor, *Journal of Applied Mechanics;* R. E. Peterson, chairman of the Advisory Board, *Applied Mechanics Reviews*, who paid high tribute to the first editor of *Reviews*, Dr. L. H. Donnell, Illinois Institute of Technology, seated at the speakers' table; and R. P. Kroon, secretary and incoming chairman of the Division. George A. Stetson, editor of MECHANICAL ENGINEERING, at the request of Mr. Goland, spoke about recent developments and plans in connection with the *Reviews* and said that replies from readers of the *Reviews* paid high compliments to it, which indicated that Dr. Donnell had established the publication at a high level of excellence. He also described briefly the aims and objectives of the Scientific Research Society of America, familiarly known as Resa, which had recently been organized by the Society of the Sigma Xi to provide for non-academic research groups the same kind of a scientific society as Sigma Xi provided in the colleges.

MANAGEMENT LUNCHEON

The annual luncheon of the ASME Management Division on November 30 attended by more than 200 members and guests provided the platform for the presentation of the Gantt Medal for 1949 and for the delivery of the Henry R. Towne Lecture.

The 1949 Henry Laurence Gantt Medal for "distinguished achievement in industrial management as a service to the community" was presented to Arthur Clinton Spurr, president of the Monongahela Power Company, Fairmount, W. Va., "in recognition of leadership in welding the industrial, agricultural, and human resources of his community into a cohesive and dynamic force that has revitalized and rehabilitated the social and economic life of the entire area to which his influence extends."

Mr. Spurr was introduced by Paul H. Griffith, Under-Secretary of Defense, who paid tribute to Mr. Spurr's business contribution to public welfare. Shortly after becoming head of his company 15 years ago, Mr. Spurr initiated and led a program of rehabilitation in the Upper Monongahela Valley which has achieved impressive economic gains.

In his response, Mr. Spurr called his company's program "just good business." The program, he said, was not a public-relations stunt or a philanthropic or altruistic move. It could be called "enlightened selfishness," he said.

"The company's stake in territorial development is the share it gets from increased prosperity for the people in its area. A heavy investment in plants and power lines makes it sound business for a power company to protect that investment by aiding the economic well being of its customers."

The 1949 Harry R. Towne lecture was delivered by Frederick S. Blackall, jr., director at large ASME, president and treasurer of the Taft-Pierce Manufacturing Company, Woonsocket, R. I. His subject was "The Obligation of Management to Provide Leadership." The Towne Lecture was initiated in 1925 by the Council of the Society as a memorial to Henry R.

"MANAGEMENT—A TRUSTEESHIP" SESSIONS DREW INTERESTED LISTENERS

Towne, president of the Society in 1887, who was noted for his work on the extension of the scope of the engineer to include economics and the essential union of production and management. The lecture serves also as a means of honoring leaders in the field of engineering, science, and economics by inviting them to present papers before the Society on phases of their work.

Mr. Blackall scored top management's failure to take a more active part in politics as "the greatest indictment of American democracy." Greater political action on the part of management was "good insurance for tomorrow's industrial climate." It was more important than ever before because of the danger of a demagogue who, equipped with an audience of millions via the radio, could push "rash" legislation through Congress.

Management's instinctive tendency to weigh proposals in the light of potential consequences becomes of vital import to the health of our political economy. "Who else will count the cost and judge as to legislative proposals whether the game is worth the candle?" he asked.

"Management has a very great obligation indeed to oppose, and influence others to oppose, all measures which will break down the strength and foundations of a great nation. It is a hazardous task which faces us. By definition, opposition is a negative process and therefore likely to be unpopular. We all like people who do things better than we like people who are against things. Nevertheless, if we are to avoid the primrose path of socialism, leading straight to the destruction of individual freedom and the sacred privileges embraced within the Bill of Rights, management must stand its ground when the crackpot and the visionary start sweeping the ground from under the free and independent citizen.

"In our island of individual freedom, surrounded as we are by austerity, socialism, fascism, and dictatorship, can anyone doubt that the paramount task of American business enterprise is to demonstrate to the world around us that the American system will function better than any other?" he asked. "Russia is confident that it will not. Many indeed, aver that she is biding her time to pounce, vulturelike, upon our moribund carcass when the swings of the business cycle plunge us into a last devastating depression."

Following the lecture, L. Keith Louden, retiring chairman of the ASME Management Division, who presided at the luncheon, was presented with a certificate of award for his services to the Division. H. B. Maynard, incoming chairman, made the presentation.

FUELS LUNCHEON

The atom bomb is antiquated as a means of warfare, Richard Harkness, noted Washington correspondent of the National Broadcasting Company, Washington, D. C., said during the Fuels luncheon held on Wednesday. He stated that bacteriological warfare would be much more devastating than the atom bomb. With germs, Mr. Harkness explained, an aggressor could wipe out the entire population of a city or area, leaving its buildings, harbors, and transport facilities intact for use by the enemy.

Speaking on "Behind the Scenes in Washington," Mr. Harkness told of his recent trip into Germany and Great Britain. He said that Great Britain is rapidly turning over its personal welfare to the state and is gradually heading for economic disaster.

He warned that we here in the United States are also approaching economic and political crossroads and that if we do not exercise better judgment as citizens—voting, community affairs—we will head directly for state socialism. Citing the coal industry as an example, he declared that the welfare state can and is happening. Too many people are looking toward Washington for benefit and not to local government, Mr. Harkness said. He pointed to the trends toward pensions, socialized medicine, and government subsidies in agriculture.

As a part of the program, President Todd presented both Julian E. Tobey and Ralph A. Sherman with certificates of Fellow grade in the Society. D. S. Frank, Mem. ASME, Pure Oil Company, Toledo, Ohio, presided.

MACHINE-DESIGN LUNCHEON

The tardiness of American industry in replacing obsolete machine tools by new models of greater productivity is slowing down the normal advancement in the American standard of living, Tell Berna, general manager of the National Machine Tool Builders' Association, told ASME members at the Machine Design Division luncheon on December 1.

AT THE WOOD INDUSTRIES LUNCHEON
(*Left to right:* E. D. May, C. R. Nichols, and Robert R. Carey.)

ENJOYING CHAT DURING MACHINE-DESIGN LUNCHEON
(*Left to right:* B. P. Graves, Tell Berna, and T. F. Githens.)

Never before in the history of our country, he said, has improvement in machine design been so rapid, and American business been so slow to take advantage of it. According to a survey recently completed by the *American Machinist*, 95 per cent of America's metalworking equipment was built to designs that are now more than ten years old.

When an advance in machine design makes possible increased productivity, benefits are realized by the wage-earner, the stockholder, and the user of the end product only if and when the new machine is put to work in the shop. But the purchase of a new machine is a capital investment in the future—and decisions to buy require a social and political climate suitable to risk or venture. Needless to say, that has not been the climate of recent years.

While tax policies have penalized investment in new capital equipment, social theorists have propounded the amazing theory that a higher standard of living comes from Government rather than machines—seeking to do by politics what can only be done by production.

Added to these retarding factors is the new philosophy engendered by some labor leaders to the effect that new and better machines destroy jobs. The result has been union limitations arbitrarily set upon the output of new machines, making it impossible to achieve, in fact, the increased productivity which has been built into them.

Unless this country is to relapse into a frozen economy, with no chance of tomorrow ever showing an improvement over today, this trend must be reversed. Obsolete machines must be replaced; labor unions must learn that more jobs and better wages depend upon greater productivity; and the public must look to technological advances instead of Government for a more abundant way of life.

WOOD-INDUSTRIES LUNCHEON

The Wood-Industries Luncheon was held Thursday, Dec. 2. Some forty members, who had earlier participated in a technical session of wood finishing, lunched together and heard Robert R. Carey, head of the law firm of Carey, Klausner, and Phorr, Jersey City, N. J., talk on "The Engineer and the Community." Judge Carey paid tribute to the late Roy V. Wright as a man who had dedicated his life to helping the engineering profession find its greater place in the world.

Referring to his own long experience of attending professional meetings, he commended members of the Division for participating in the Annual Meeting. "Here you find something you cannot get in your shops—you broaden your concepts—you gain confidence in your work by talking things over with your colleagues."

According to Judge Carey, engineering was "the most intensively developed profession in the United States." It was the oldest profession, he claimed, because the master workmen mentioned in the first books of the Bible were engineers.

AMERICAN ROCKET SOCIETY DINNER

The American Rocket Society, which is affiliated with the ASME, held its second honors-night dinner, Dec. 2, 1949, as part of the fourth ARS annual convention in conjunction with the ASME Annual Meeting. More than 150 members and guests were present.

The Goddard Memorial Lecture Award, a gold medal, was presented to Admiral Calvin Mathews Bolster, U. S. Navy, for "exceptional vision and leadership in support of research and development throughout the field of rocket propulsion. For developments initiated under his direction as head of the Ships Installations Branch of the Bureau of Aeronautics, including the Jet-Assisted Take-Off Program, which contributed so successfully to the operation of patrol bombers and air-sea rescue operations during the war; the liquid-rocket-engine developments and high-speed research aircraft; and programs which are responsible for much progress in underwater propulsion utilizing jet-propulsion principles."

The C. M. Hickman Award for "work in initiating the development of the Aerobee rocket and for his contribution toward upper-atmosphere research with rockets as supervisor of upper-atmosphere research of the Applied Physics Laboratory of The Johns Hopkins University" went to James A. Van Allen. Dr. Van Allen is also a member of the principal professional staff of the Laboratory as well as the Proximity Fuse Group.

Leon Cooper, a graduate of the City College of New York, who is rocket test engineer at Bell Aircraft Company, Buffalo, N. Y., was presented the ARS Student Award for the best paper prepared by a student member of the ARS for the year 1949. His paper was entitled, "Rocket Motor Testing and Design."

Following presentation of honors, Dan A. Kimball, Under-Secretary of the Navy, spoke on "The Complexities of Peace." Mr. Kimball called for "a stock pile of proven research," which he termed as necessary as stock piles of strategic materials.

HYDRAULIC OLD-TIMERS' DINNER

When members of the ASME Hydraulic Division get to-

AT THE ANNUAL DINNER OF THE AMERICAN ROCKET SOCIETY
(*Left to right:* C. M. Hickman, Mrs. Robert H. Goddard, Admiral Calvin M. Bolster, and Dan A. Kimball.)

gether there is no telling what will happen. It was no different this year when the Division held its fourth annual old-timers' dinner, Tuesday, November 29—no different except for the absence of C. M. Allen and Lewis F. Moody, two of the best-loved and most admired "old-timers" of the Division. Both were unable to attend the Annual Meeting.

More than 50 members enjoyed a pleasant evening among friends from many sections of the country. When J. F. Roberts, retiring chairman of the Division, called for order, he inadvertently referred to the dinner as the third in the Old-Timers' series and was heckled until he re-established order by appointing a captain at each table to maintain quiet. The warmth and fraternity which prevailed was perhaps unrivaled by any other social event of the ASME Annual Meeting. A feature of the evening was an old-fashioned spelldown for which each table appointed sides. Hydraulic terms were used to pick off the contestants.

TECHNICAL PROGRAM

A comprehensive and accurate picture of the advance of American technology, highlighted by many discoveries and developments in science and industry, was presented at the 1949 ASME Annual Meeting's 78 technical sessions. Some 200 papers were given during the five-day meeting.

Fundamental problems in rocket research, the use of strategic materials on jet and rocket applications, hydrogen peroxide and nitrogen as rocket fuels, the thermodynamic properties of helium, and the handling of liquid oxygen and the handling of "hot" atoms, were amply covered. Findings in the use of radioisotopes as research tools in engineering were out-lined.

Symposia included topics on railroads as our largest materials-handling industry, new developments on the use of fly ash which promise to solve the disposal problem, employment prospects for the junior engineer in 1950; and a special day was devoted to Air-Cargo Transport.

In addition, the Management Division sponsored six sessions on "Management—A Trusteeship," covering the obligation of management to create a better industrial life, to control costs, to create quality, to lower distribution costs, and to be competent.

Other fields covered were the advances in rubber and plastics during the past year, petroleum, wood industries, railroads, production engineering, process industries, oil and gas power, metals engineering, materials handling, machine design, industrial instruments and regulators, hydraulics, heat transfer, gas turbines, fuels, applied mechanics, aviation, power, and education.

Pages 84–86 contain a list of the preprints that were made available at the Meeting. The list is arranged according to divisions and committees. In the ASME Technical Digest section of the December, 1949, issue of MECHANICAL ENGINEERING, 28 digests of Annual Meeting preprints appeared; this issue contains 43 digests, pages 27–40. Digests of any remaining Annual Meeting preprints will be published in the ASME Technical Digest section of forthcoming issues of MECHANICAL ENGINEERING.

Pamphlet copies of the preprints are available from the ASME Order Department, 29 West 39th St., New York 18, N. Y. When ordering please give title, author, and paper number. Price, 25 cents per copy to ASME members.

TEXTILE DIVISION

The Annual Meeting of the ASME Textile Division, held on Friday, December 2, consisted of two technical sessions at which six papers were presented.

At the morning session, A. G. Klock, quality-control superintendent of the Bigelow-Sanford Carpet Company, Inc., Thompsonville, Conn., discussed "building quality-mindedness at Bigelow." He pointed out that the Bigelow quality-control department is set up to carry out the following four steps: Maintain value, minimize waste, advance knowledge, and control quality.

The quality-control department which carries out these four steps, he said, is made up of the following five subdivisions:

wool inspection, color passing, process inspection, laboratory and engineering staff.

The essence of the quality-control program has been putting old tools to work. The method of presentation, the psychology behind each phase of the work, and the timing are the keys to successful selling of such a program.

Some engineering aspects of sewing threads were presented by Stefan L. Grapnel, Jun. ASME, a research engineer for Belding Heminway Corticelli, Putnam, Conn. He dealt with the general attributes of sewing threads as different from yarns. Sewability requirements and tentative tests were discussed by Mr. Grapnel. Most of the paper was confined to the treatment of functional differences in engineering properties between cotton and nylon threads and between usual nylon threads and the nylon monochords.

AIR CONDITIONING

Textile air-conditioning developments were outlined by Phillip Langford Davidson, Mem. ASME, consulting engineer, Philadelphia, Pa., in the third paper on the program. He pointed out that the phrase "air conditioning" had its birth in the textile industry where the process of controlling the temperature and humidity of the air within mill interiors was primarily considered as conditioning yarn by means of air.

Responsible for changes in air-conditioning systems, he said, are the invention of hundreds of new machines like the double-deck twister and the design and production of new fibers to meet the varying fashion trends requiring very sudden changing of the arrangement of machine operation. He explained that the substitution of fibers such as nylon for silk, rayon for cotton, or spun for filament yarns requires changes in the relative humidity required for the process. This change in styling necessitates changes in the capacity or distribution of the air-conditioning system, he said.

The days of moisturizing the air by wetting the floor with a hose or by mechanically spraying moisture into the air, are over, Mr. Davidson said. Recent years have brought several new engineering developments, among which are the unitary and central-station systems of air conditioning, electrostatic filters, the elimination of windows in factories, changes in wall structures and insulation techniques, refrigeration, and several others, he said.

FIBERGLAS TEXTILES

In the afternoon, at the second Textile session, John K. Park, manager of the textile research laboratory, Owens-Corning Fiberglas Corporation, Ashton, R. I., discussed the rise of Fiberglas textiles in industry. The combination of many unique qualities in one material makes fibrous glass outstanding for a variety of products which help to solve everyday problems, said Mr. Park. Fiberglas textiles, for instance, are noncombustible, and therefore answer the need for fireproof draperies in public places and the home. As glass fibers do not absorb water, curtains made of them will not shrink. Since only the surface gets wet when they are washed, drying is a matter of a few minutes. Because fibrous glass resists most chemicals, they will not mildew, fade, or rot.

In addition to these advantages, glass in fiber form has a flexibility which gives textiles hand and drape qualities. Now that glass textiles can be dyed or printed in any color or shade they are finding a new use as decorative fabrics, Mr. Park said.

Cloth woven of Fiberglas yarns and coated with vinyl is another example of combining properties to provide improved performance. Convertible auto tops are now being made of this coated cloth which will last three to four years instead of the usual year or so.

These same qualities are utilized in coated fabrics for awnings, upholstery, fender welt, gaskets, and the like.

For the electrical industry these fibers provide a low-cost insulation with great overload protection for all types of motors, transformers, and other electrical equipment. In addition, they are used in the manufacture of many types of wires and cables, he said.

The ability of fibrous glass to conduct heat can be varied at will between very low and relatively high limits, Mr. Park explained. When thermal insulation is desired, the fibers are used in bulk jackstraw arrangement, leaving millions of little air spaces between the fibers. On the other hand, where the rapid transfer of heat is important, as in the coils of a motor, the fibers, when laid parallel to one another in the form of yarns or tapes, will reduce the number of air spaces and increase the area of contact, thereby increasing the efficiency of the motor.

NEED FOR ENGINEERS

An engineering approach is the textile industry's most urgent need, James R. Longstreet of the textile division, The Warner & Swasey Company, Cleveland, Ohio, pointed out in the second paper.

Engineers are needed in the textile industry now more than ever before because mechanical complications have eliminated the individual who can qualify as both operator and maintenance man, he asserted.

If the average mill owner fails to recognize this fact, Mr. Longstreet said, he will most likely find that at the year's end his expenses have increased while his production has decreased.

Mr. Longstreet told of one producer who was working with nylon and overloaded his machine in the processing step. The result was continual breakdown and failure to meet production requirements.

Mr. Longstreet indicated that the problem of maintenance in both the large and small mill is a serious one, but that the engineer who knows his equipment and can apply analytical reasoning, can cut costs and waste to a degree that most operators fail to realize.

INSTRUMENTATION

In the final paper on the program, attention was focused on the progress in the use of modern textile processing machines with instruments for recording and controlling the many variables ecnountered in textile manufacturing processes. Lee Cuckler, application engineer for the Brown Instrument Company, division of Minneapolis-Honeywell Regulator Company, Philadelphia, Pa., said that emphasis is on production instrumentation as applied to slasher-room processes, air conditioning, and finishing and dyeing operations. Control systems for size cooking and storage, size-box level and temperature, cylinder temperature, and warp regain were described.

In general, he stated, more emphasis will be placed on production instrumentation than on safety and laboratory instrumentation.

In order to measure such variables as torque, force, strain, speed, time, thickness, color, chemical composition, counting moisture content, pH, and various electrical characteristics, many of the new instruments use electronic principles and components for their basic actuation.

Many of the mechanical-type instruments have thus been rendered obsolete, he said. It has been found that measurement made by electronic instruments were more sensitive, accurate, and reliable, than those made by mechanical devices. Examples cited were matching of colors, determination of light intensity, measurement of pH, and analysis of chemical composition.

MANAGEMENT

The manager, originally devoted solely to the interests of the owner, is increasingly called upon to balance the interests of employees, customers, and the community, along with the interests of ownership. This year, therefore, the Management Division devoted its program to the topic of "Management—A Trusteeship," highlighting several important areas in which the manager must qualify to meet the specification of this new position of trusteeship and the obligations which will be imposed on him.

Sounding the keynote of this program and speaking on the obligations implied by trusteeship, Wilfred Wottrich, vice-president in charge of the personal trust department of the Manufacturers Trust Company, New York, N. Y., declared that economic and social trends have placed management in the new role of trustee to the stockholder, labor, consumer, community, and the public. He said the safety and development of the free-enterprise system is management's most important trust for the public.

As the administrator of business and its property, in the position of trustee with fiduciary responsibilities toward the beneficiaries of business, management must be loyal to the interests of all and must perform its obligations impartially.

Management needs to discard the idea that it holds a vested position with certain property rights, he said.

Today it is almost impossible for one man alone to conduct the average business undertaking, he said, adding that several centuries of economic growth since the artisan or craftsman conducted his one-man business solely for private gain have shifted the emphasis from the activities of a man to the activities of capital. In place of the capital of one man in a venture, he pointed out, there is the capital of many investors or owners.

CREATING BETTER LIFE

The second session was devoted to the obligation of management to create a better life. Giving labor's view on this phase, Harry Read, director of the Committee on Health, Safety, and Welfare, Congress of Industrial Organizations, Washington, D. C., accused the newspapers and the radio of withholding news about the recent convention of that group in Cleveland.

People have been given the impression by the press that the only issue discussed at these conventions was communism, said Mr. Read.

Asserting that only the shortcomings of the CIO were presented, Mr. Read said:

"You have not learned from your daily newspaper that that Convention adopted 65 resolutions, only a half dozen of which had to do with the internal affairs of the CIO. Those other resolutions dealt with various phases of our national economy, with our natural resources, with the general welfare of the community, with United States foreign policy, with political action, with education, and with a great many other subjects that concern the well-being of American citizens. But you never hear those things about the CIO when it gathers in conventions."

The labor leader drew attention to the fact that there are in this country today tens of thousands of small business ventures where the employer consults with his employees on every operational phase of the business.

He attributed American prosperity and the ability of this country to produce things in tremendous quantities to the skill and intelligence of the common men and women.

Declaring that the "working people" of the U. S. deserve "better treatment," Mr. Read said that we have no desire to deprive management of what it receives, but we do say that industry must be so operated as to provide security for all of the people employed in it. In short, we believe that industrial labor, in view of the service which it renders, is entitled to better treatment than it receives in this matter of security.

Speaking for management, Fred C. Fischer, assistant director of Personnel and Industrial Relations of R. H. Macy and Company, Inc., New York, N. Y., said that multiemployer groups organized on a community or regional basis and able to negotiate with labor on a long-range basis would eliminate "patchwork" settlements thus tending to eliminate strikes and the procedure that "imposes on the small marginal company the same demands that are applied to the industrial giant on the ground that these demands are part of this year's pattern."

For many years management has projected its sales, production, plant expansion and financing plans for three, five, even ten years; why not the same with labor relations? he asked.

Such plans, he said, could be developed at three rough stages. The first would include features that a small business might justify economically, the second those goals that a middle-size business would support, and the third a program which could be financed by our major industries.

He warned that "unless we achieve on a very broad basis some such high level of relationship, management and labor will be jointly guilty of transferring their own freedom of operation into the hands of the state, and with this transfer will go much of our present way of life."

COST CONTROL

The obligation of management to control costs was the subject of the third session.

Speaking for industrial engineering, Bruce Wallace, vice-president and treasurer of the Otis Elevator Company, New York, N. Y., said that the necessity for controlling costs should be considered from two different viewpoints—first, the necessity for each firm to solve its immediate problems from day to day, and second, the long-range problem which applies generally to all industry.

He declared that, to control costs, it is management's responsibility first to bend every effort to improve productivity within its own plant. Second, it can resist every effort to the limit to grant concessions which either decreases productivity or adds to the cost any items which decrease real wages. The third obligation that management has is to resist current philosophy advocated by both the labor unions and the government; that it is everyone's inherent right to enjoy the better things of life, whether he produces them or not; that he is underprivileged if he does not have them; that the other fellow, who has more money, or some wealthy corporation will pay the entire bill.

D. M. Voightsberger, comptroller, The S. S. White Dental Manufacturing Company, Philadelphia, Pa., pointed out that the "how" for controlling costs were good supervision, proper training and placement of personnel, good engineering and tooling, efficient purchasing of materials, competent inspection, proper coverage by time study, careful planning and scheduling of work so that operators are free to produce and are not held back by shortages, proper information to aid foremen in laying out their work and distributing operators where they are necessary and in a manner to avoid being overorganized.

Further control of costs should result in consistent reduction not alone in direct costs but in overhead costs throughout the entire organization.

A practical viewpoint of the control of maintenance costs was given by Howard Bishop, chief industrial engineer, Youngstown Sheet and Tube Company, Youngstown, Ohio.

GORDON VAN ARK SPEAKS ON COMPETENCY AT ONE OF THE MANAGEMENT SESSIONS

He singled out two distinct but closely related activities: preventive maintenance and emergency repairs.

Preventive maintenance is a constant effort to prevent equipment failure, and maintain quality of product through periodic inspection, adjustment, repair, and overhauling of equipment.

Emergency repair is the repair or adjustment of equipment after it has broken down or has begun to operate improperly.

He stated that the control of maintenance costs begins in the engineering and purchasing of equipment; therefore equipment suitable for the work to be performed should be procured. In existing installations the type and condition of the equipment should be considered.

Factors such as organization, labor costs, proper supervision and administration of maintenance work are also important.

QUALITY CONTROL

Quality control as it relates to the obligation of management was chosen as the topic for the fourth session.

Speaking on psychology and quality-control packs a punch, Charles R. Scott, Jr., Jun. ASME, manager, SKF Industries, Inc., Philadelphia, Pa., indicated that from an engineering viewpoint an achievement through state of mind is a highly efficient operation. An employee's mental attitude plays a big part in the type of work that he does. Good quality does not just happen. In addition to the statistical techniques to gaging equipment, there must be added the human factor to complete the triangle.

Instilling an attitude of quality-mindedness in supervision as well as employees is indeed an important and ofttimes overlooked item in the endeavor to maintain good quality at an economic level, he stated. Quality workmanship is something which cannot be forced out of a man. Employees must be enlisted into the cause by the teamplay relationship and by the leadership of the supervisors quite as much as by organizational authority.

Harrison Dunning, general manager of the Scott Paper Company, Chester, Pa., gave some high lights on how the human factor enters into quality control and how it was applied in his company.

DISTRIBUTION

Lower distribution costs as an obligation of management were covered in the fifth session.

The benefits of a "creative distribution system" were stressed by Chester H. Lang, vice-president in charge of sales, apparatus department, General Electric Company, New York, N. Y. He said that such a system is one of industry's finest instruments to reduce costs and increase profits.

Mr. Lang pointed out that effective distribution can be achieved only through the efforts of design, application, and service engineers, advertising men, and salesmen operating under progressive management's leadership.

For effective distribution, he advised business carefully to define its distribution functions, assign its management to experienced and imaginative specialists, and put somebody in charge of the whole operation to co-ordinate and direct the company's distribution operations.

William J. Sampson, president of the American Welding and Management Company, Warren, Ohio, declared that market studies are a "must" in distributing products. He stated that the most important steps in the operation are as follows: First, inclusion in the study of an analysis of plant and personnel—followed by consideration of product design—to fit in with available equipment and skills. Second, conduct of the study in such a way that department heads, supervisory forces, and production workers are kept informed of progress. Third, the development of a continuing follow-up of sales statistics and profit figures so that management could know exactly what was happening from the distribution as well as production point of view. Fourth, establishment of a pattern of continual contact with engineers and designers of companies which still are in a position to award profitable subcontracts.

A modern wholesale hardware plant was described by C. J. Whipple, chairman of the board, Hibbard, Spencer, Bartlett and Company, Evanston, Ill. The building is of one-story construction 1060 ft long and 800 ft wide divided approximately into thirds by two switch tracks, which run nearly the entire length of the building and inside the building. Incoming cars containing merchandise for stock can be spotted at an average of 75 ft from the place in the warehouse floor where merchandise is stored. There are no interior walls in the building. An enclosed space for unloading onto trucks containing inbound merchandise is provided. A similar space is provided for outgoing trucks at the opposite end. He also discussed the handling of orders, stock layouts, and the like.

COMPETENCY

The session on the obligation of management to be competent was opened by Thomas H. Nelson, partner, Rogers and Slade, New York, N. Y., who said that communism's chances of winning the war it is now waging depend more on our incompetence to manage our economic system during peace than any lack of ability to wage a successful war.

Democracy itself leans heavily on the management of our economic life, he said. Nothing would give greater joy to the communistic ideology than a devastating depression in the United States. These enemies of democracy have more hope in management's inability to avoid depression than in their atom bombs and their superiority of military forces.

Mr. Nelson said that while democracy needs its statesmen and must have adequate and qualified military leadership, it most of all "rests upon management's ability to manage our

economic system to the satisfaction of investors, of employees, of customers, and of the public."

George B. Corless, director of executive development, Standard Oil Company of New Jersey, New York, N. Y., described Jersey's four-point program for developing executives. The four main steps according to Mr. Corless are organization planning, selection of candidates for replacements, appraisals of executive abilities, and development or training to fill gaps in experience.

AIR-CARGO TRANSPORTATION

The growth of air cargo during the past 20 years has gone through several phases. Mail and express items of air cargo originally started the airlines on their way. Air transportation then graduated to passengers, but now air freight—just about five years old—becomes of such importance as to forecast that cargo again will become the primary source of traffic and revenue.

A special feature, therefore, of the 1949 ASME Annual Meeting was the setting aside of Tuesday, November 29, as "Air-Cargo Day," to give a co-ordinated picture of the present experience and future requirements of the civilian and military movement of freight by air. The one-day program, cosponsored with ASME, by the Institute of Aeronautical Sciences, and the Society of Automotive Engineers, included a trip to Newark Airport in the afternoon. At Newark, the world's busiest commercial air-cargo terminal, new types of cargo aircraft, and the latest ground-handling equipment were inspected by members and guests. In addition, on display in the foyer of the Keystone Room at the Statler, were models of an air-cargo terminal of the future, complete with moving trucks, ramps, planes, and the like; a Boeing Stratoliner; the Chase Avitruc; and a display of the Douglas Aircraft Company's various cargo planes. Also shown was a large map of MATS air routes all over the world around which were grouped photographs of various loads that have been handled and planes used to carry them.

AIR CARGO TO STAY

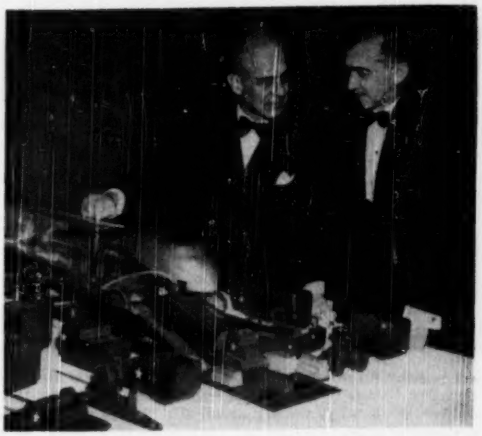
At the first technical session devoted to Air-Cargo Transport, Charles Froesch, chief engineer of Eastern Airlines, Inc., New York, N. Y., emphasized that air cargo is here to stay; it has proved that merchandise of a relatively high value per pound or cubic foot can be most economically transported by air, at an over-all saving to both the shipper and receiver.

Today the country is well covered with a network of convenient air-cargo schedules operated by the scheduled airlines and all-freight carriers recently certificated by the Civil Aeronautics Board, he said, with over 200 cargo transports carrying a collective 220,000 ton-miles per hour.

The speed advantage of air freight permits merchants to keep minimum inventories, meaning low capital investment and high merchandise turnovers, Mr. Froesch pointed out. This is of particular advantage during periods of falling prices.

During the past eleven years the volume of air cargo, which includes both air express and air freight, has risen from 2,200,000 to an estimated 135,000,000 ton-miles for 1949, Mr. Froesch stated. He added that before air-cargo volume can reach the size it rightfully deserves, it will be necessary that aircraft specially designed for cargo service be used, handling costs reduced, and proper warehousing and distributing facilities be erected in order to lower operating costs, give the shipper and receiver the best possible service, and earn a profit on the capital investment of the operator.

Few airports in the United States have proper warehouse and cargo-handling facilities, because of the high cost, he pointed out. Large platform-type buildings used as air-cargo terminals, are necessary at the airport. Docks of truckbed height must be made available for the loading and unloading of commercial trucks and trailers shuttling merchandise back and forth between the traffic generating centers and the airport. Such platforms must be of suitable height to load and unload aircraft by conveyers, movable fingers, or gangplanks.



MILITARY AIR CARGO TRANSPORT

(Lieut. Gen. James Doolittle, *left*, shown with Preston R. Basset, past-president of the Institute of Aeronautical Sciences, at the Air-Cargo Exhibit. The exhibit was co-sponsored with ASME by the IAS and the Society of Automotive Engineers.)

Mr. Froesch emphasized that separate cargo-terminal facilities should be provided at each airport where cartage agents could deliver or pick up large shipments of air freight by a single truck movement to expedite transportation to and from the airport.

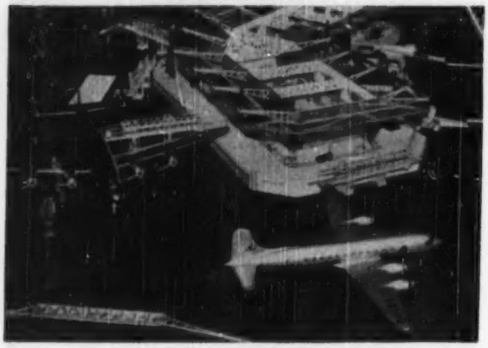
IMPROVING CARGO AIRCRAFT CONTINUALLY

The necessity of improving cargo aircraft was outlined by W. W. Davies, director of engineering, United Airlines, Inc., San Francisco, Calif. He pointed out that since speed is the primary asset of air transportation, the cargo airplane of the future will be a high-speed transport.

Prime importance in the air-freight operations of the future is the ability to maintain high-schedule reliability. On-time performance will continue to be as important to cargo-aircraft operation as it is to passenger-aircraft operation. The airplane requires the latest communications and navigational equipment and adequate anti-icing equipment. The safety of the cargo airplane is as important as it is for passenger craft.

Mr. Davies said that an effort should be made in the cargo airplane of the future to design and work toward presently and generally accepted means of shipping and materials-handling equipment rather than the development of special and costly equipment which offers questionable gain in the long run. There will be undoubtedly a much more expanding use of preloaded containers and pallets whereby the cargo can be handled quickly and efficiently in and out of the airplane.

One other strong point in the design and operation of the future cargo airplane touched on by Mr. Davies is the development of equipment that is simple: simplicity of design, operation, and maintenance. This must be done in order to permit maximum efficiency.



AIR-FREIGHT TERMINAL OF FUTURE, SHOWING LANDING AND UNLOADING PLATFORMS

AIR-CARGO GROUND HANDLING

R. Dixon Speas, special assistant to the president, American Airlines, Inc., New York, N. Y., stressed the importance of air-cargo ground handling and discussed the improvements required in this phase. Some specific recommendations made by Mr. Speas were the need for a careful and objective study of the cargo flow from shipper to consignee; speeding up pick-up and delivery services; better aircraft utilization; improved cargo-terminal design with better plane-to-dock facility features; streamlining of paper work with regard to cargo operations; more efficient utilization of man power at the cargo terminal; and reliable cargo security through training and discipline of personnel and actual testing of shipments.

MILITARY AIR TRANSPORTATION

Military air transportation as a force for peace was covered by Major General William H. Tunner, AAF, Deputy Commander for Operations, Military Air Transport Service, Andrews Air Force Base, Washington, D. C., during the evening sessions. General Tunner reviewed some of the early military air-freight experiences, discussed the recent Berlin airlift, and then turned to the subject of what the military needs in a cargo-transport aircraft. The primary consideration in design, he said, must of course be an aircraft able to accomplish the mission, but with maximum economy.

Perhaps the most significant contributor to cheap and dependable air transportation is low-maintenance requirement.

Aircraft engines, in addition to being dependable and rugged, must be designed so that they can be replaced in a few minutes. Continuous operation between engine overhauls should be at least 1200 hours.

Electrical and hydraulic systems must be simplified.

The airplane must be designed so as to permit loading and unloading from normal truck bodies with the minimum use of auxiliary equipment.

The contour of the cargo-transport airplane should emphasize a fuselage design sufficiently wide to permit storing of two passenger-type vehicles or equivalent items side by side throughout its usable length.

Cargo doors, of which there should be more than one, must be ample in size to permit the direct ramp loading of a 6 × 6 truck with its canopy.

General Tunner believes the airplane should be a conventional 4-engine type, capable of laying down 25 tons after a 3000-mile flight, or 5000-mile range with no load.

The aircraft cabin must have means for conditioning and safeguarding the cargo in all weather.

Operation with a crew of not more than three persons over land and five persons when over water, would be desired.

A speed of 250 miles per hour seems adequate, he said.

The airplane should have the ability to climb to 20,000 feet with a full load and to sustain operations at that altitude, permitting over-flying normal bad weather found in trans-Atlantic crossing.

It should have adequate power and flight characteristics to be able to safely use the 6000-ft runways on airports now in existence.

The aircraft must have a landing gear providing enough surface distribution of weight in its contact with the ground to permit operation of 100-ton aircraft from the runways now available throughout the world for transport operations.

It should be equipped with the installation for Jato type systems giving added power boost on take-off.

Electronic navigational equipment is also desired, including radio and radar altimeters, instrument landing system, and long-range aerial-navigation radio and radar equipment.

ADVANCED AIR-FREIGHT TERMINALS

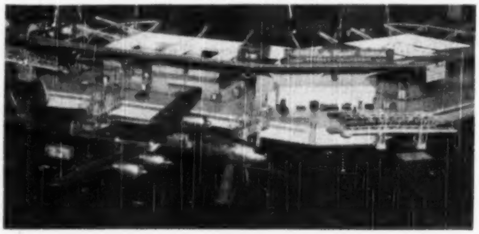
L. R. Hackney, air-cargo specialist of the Lockheed Aircraft Corporation, Burbank, Calif., said that until such time as adequate and intelligently planned terminals are provided for the air-freight industry, its expansion will be retarded.

He pointed out that in many instances the cost of handling air freight from the consigner into the airfreighter and from there to the consignee approaches the actual expense of the air haul. Also, it is not uncommon to have the time during which the freight is on the ground in pickup and delivery, waybilling and manifesting, loading and unloading exceed the time the freight is in the air, he declared.

The military logistics value of a series of properly designed and equipped air-freight terminals of standard design can be of untold value in the event of national emergency, Mr. Hackney pointed out. These terminals could be utilized by the Military Air Transport Service, to supplement their existing facilities, for in time of national emergency there is always a need to requisition and transport vast supplies of critically needed materials. The Commercial air-freight terminal would provide an important link in this chain. In time of stress its normal capacity could be increased many times over on an "around the clock" basis.

ASME RESEARCH COMMITTEES

In addition to a business meeting, the Research Committee renewed its war-interrupted joint meetings with the Professional Divisions Research Secretaries. The purpose of the Divisional Research Secretary and of these joint meetings is to



PART OF AIR-CARGO EXHIBIT IS THIS AIR-FREIGHT TERMINAL OF THE FUTURE

bring to light the necessity for research on broad-interest problems in the areas covered by the Divisions' activities. Almost 350 committee members and guests attended nineteen meetings held by the Society's special and joint research committees and their subcommittees for discussion of current and future projects. Ten technical sessions, listing thirty papers, were sponsored by certain of these groups, cosponsorship being provided by five Divisions and one outside organization.

SUPERTEMPERATURE STEAM GENERATION

Of prime importance was the development of further detailed plans for the research program aimed at higher thermal economies in steam power generation by utilizing steam temperatures up to 1500 F. This ASME-sponsored project will be guided by the Research Committee on High Temperature Steam Generation. Industry's acceptance of this project to date indicates that its cost ($176,000) will be successfully underwritten. The committee-sponsored technical session highlighted information on (*a*) heat transfer to superheated steam at high pressures (Paper No. 49—A-32) and (*b*) possibilities of the regenerative steam cycle at temperatures up to 1600 F (Paper No. 49—A-33). Discussion of these, and of the program generally, disclosed new requirements for data on thermal properties of steam. The project will be described in more detail in an early issue of MECHANICAL ENGINEERING.

VISCOSITY OF LUBRICANTS UNDER HIGH PRESSURE

Progress in the ASME-sponsored project on pressure-viscosity characteristics of lubricants was reviewed by the Research Committee on Lubrication. This program, now well under way, will provide reliable viscosity data (in kinematic and absolute units) for basic types of petroleum-base and synthetic lubricants at pressures up to 450,000 psi, and in the temperature range 32 F to 425 F. This work, costing over $200,000, is made possible by industry's co-operation in underwriting the experimental costs, and in supplying oil samples and the physical and chemical test data thereon.

FLOW MEASUREMENT

Further progress on determination of discharge coefficients of eccentric and segmental orifices was reported to the Research Committee on Fluid Meters. Little standardized information has been available on these orifice types which are much used for measuring fluids carrying impurities. Prof. S. R. Beitler, committee chairman and project director, said that a final report would be made in 1950. H. S. Bean, chairman of the Joint AGA-ASME Committee on Gas Measurement, reported advances made in new determinations of orifice coefficients at the Naval Boiler and Turbine Laboratory, Philadelphia, Pa., and at the gas measurement station, Rockville, Md.

ROLLING OF METALS

The Research Committee on Plastic Flow of Metals heard Prof. C. W. MacGregor and Richard B. Palme describe new equipment developed during the past year in the project to determine the mechanism of plastic flow—normal, and longitudinal and transverse shearing stresses—established in metal along the arc of contact with the roll as it is rolled. This project is now in its fourth year.

BOILER-FURNACE PERFORMANCE

Continuing its study of factors affecting the performance of boiler furnaces, the Research Committee on Furnace Performance Factors developed preliminary plans for testing a spreader stoker-fired furnace, using coal and lignite as fuels, following which a wet-bottom furnace in the 600,000-lb-per-hr range will be tested. Ultimately, it is planned to conclude this test program with a dry-bottom furnace of one million pound-per-hour capacity to permit evaluation of the size factor. Because previous tests have almost exhausted available funds, a campaign to obtain financial support early in 1950 was planned.

EFFECT OF TEMPERATURE ON METALS

The Joint (ASTM-ASME) Committee on Effect of Temperature on the Properties of Metals, five of its Panels, and it Technical Advisory Committee met to consider requirements for high-temperature metallurgical information in the various fields which it serves. Funds will be required for the several projects rapidly taking form. Of particular interest are plans for revising "Creep Data," published in 1938. This will require a comprehensive survey of information available in government, industrial, and private laboratories.

In addition to the foregoing, the following research committees also met: Automatic Regulation Theory, Boiler Feedwater Studies, Cutting Fluids, Metal-Cutting Data and Bibliography, and Strength of Vessels Under External Pressure. Of particular interest was the assignment of Dr. O. W. Boston as editor for the revision of the "Manual on Cutting of Metals"; the summary report of work to date on automatic regulation theory; and the transfer to Boiler Code Committee cognizance of the work on strength of vessels under external pressure.

ASME STANDARDS COMMITTEES

Summary reports presented at the Annual Meeting indicate that the 1948–1949 record of 26 projects completed will be exceeded during the coming fiscal year by the expected release of 45 standards and codes aimed at standardization for industry. The past year's record has more than doubled the average of the preceding ten years.

The sectional committee on Code for Pressure Piping, B31, reorganized one year ago, has already developed drafts of the six main sections of a revised piping code and expects to secure agreement in principle to this major revision during the early months of 1950. The present 1942 code has been found much out of date and the matter of revision is urgent.

A project for standardization of compression fittings for tubing has been accepted by sectional committee B16 on Pipe Flanges and Fittings, and assigned to a subcommittee for investigation.

Supplementing the work of the Fuels Division in the preparation and publication of "Example Sections for a Smoke Regulation Ordinance" released last spring, a new Air Pollution Control Committee has taken first steps toward bringing together many organizations both inside and outside the ASME to co-ordinate many independent operations in this field. The name "air-pollution control" rather than "smoke control" was chosen for the committee to indicate that its scope includes consideration of all types of solids, vapors, and gases discharged from stacks.

INSPECTION TRIPS

MERGENTHALER LINOTYPE COMPANY

During the ASME Annual Meeting many of the guests went on inspection trips to: Mergenthaler Linotype Company, Brooklyn, N. Y., where an interesting tour covering the manufacture and assembly of linotype machines and matrixes was conducted by Harry Porte, vice-president in charge of sales.

NEW YORK CENTRAL SYSTEM—GRAND CENTRAL TERMINAL

A "behind-the-scenes" tour of the New York Central System, Grand Central Terminal, the largest railroad terminal in the United States, was in charge of E. B. Morehouse, terminal manager. The guests learned about the construction of the

Grand Central Terminal and the signaling operations of the thirty-four miles of track within the terminal yards and on two levels, plus many interesting engineering features of this terminal.

TIDEWATER ASSOCIATED OIL COMPANY, BAYWAY REFINERY

Guests who went on the inspection trip of the Tidewater Associated Oil Company, Bayway Refinery, N. J., had an opportunity to see the new crude-oil refining units of the latest type with vacuum and pressure towers, new Propane Furfural Deasphalting unit and the new Solvent Dewaxing plant, a moving-bed catalytic Houdry cracking unit, a fixed-bed Houdry cracking unit which includes a 10,000-hp heat turbine, and a new Polymerization plant. Also included in this trip was an inspection of complete lubricating-oil facilities with a percolation filter plant and the complete power facilities for the entire refinery. The host was G. C. Caine, general superintendent.

NEWARK AIRPORT

Some went to Newark Airport, Newark, N. J., to visit the world's foremost commercial air-cargo center and saw cargo planes and make a tour of seven cargo terminals with handling equipment in operation.

WORTHINGTON PUMP AND MACHINERY CORPORATION

E. J. Tribble, works manager, Worthington Pump and Machinery Corporation, Harrison, N. J., conducted a trip through the plant, which included a tour of the engineering department and pattern shops, bronze, iron, and steel foundries. These foundries were completely modernized within the past eighteen months and produce castings for the production of pumps, steam condensers, power-plant equipment, air-conditioning, and refrigeration equipment, compressors, and feedwater heaters.

WALDORF-ASTORIA HOTEL

T. J. Barrett, assistant superintendent, The Waldorf-Astoria Hotel, New York, N. Y., was host to a group who visited the hotel. The tour covered the complete mechanical operation of the building, including all steam distribution, electrical distribution, domestic refrigeration (kitchen) and air conditioning for rooms and banquet rooms. Also the fire-control system, and the general supervision of the mechanical equipment relative to the maintenance and repairs and new installations.

BROOKLYN-BATTERY TUNNEL

The trip to Brooklyn-Battery Tunnel, New York, N. Y., afforded the visitors an opportunity to visit the longest vehicular tunnel in the United States and the second longest vehicular tunnel in the world—9117 feet between portals. The tour covered the inspection of the Manhattan end of the tunnel including the blower building, underground exhaust chamber, and equipment. Ralph Smillie, chief engineer, was host.

SEWAREN GENERATING STATION

W. R. LaMotte, general superintendent of generation, conducted a trip through the Sewaren Generating Station of the Public Service Electric and Gas Company, Sewaren, N. J., an outstanding example of the latest in power-station design where dependable and labor-saving electric energy is generated for the use of the million customers of Public Service. The three units now in operation, each 100,000 kw, together with a fourth unit scheduled for installation in 1951, operate on the conventional regenerative cycle with throttle steam conditions of 1500 psig, 1050 F. The station is characterized by centralized remote control for each pair of two units.

AMERICAN MOLASSES COMPANY

F. C. Saples, vice-president, American Molasses Company, Brooklyn, N. Y., was in charge of a trip through the Sucrest Refinery of the company, which covered the handling of raw sugar in bulk, and the operation of centrifugals and filter presses.

COLLEGE REUNIONS

With so many mechanical engineers in town for the 1949 ASME Annual Meeting, many of the engineering schools took advantage of the situation by holding reunions during the week.

The Brown University Engineering Association held its annual dinner, on Thursday, December 1, 1949, at the Fifth Avenue Hotel. Dr. Henry M. Wriston was the principal speaker. There were 51 guests present.

The University of California, Berkeley and Los Angeles, reunion was attended by 54 members and was held at the Bonat Cafe on December 1. Prof. R. G. Folsom was master of ceremonies, Dean M. P. O'Brien welcomed the guests, and the speaker of the evening was Dean L. M. K. Boelter.

The reunion dinner of Clarkson College was held at the Building Trades Employers Association on December 1 and 30 guests attended.

The Cooper Union reunion was held on December 1 in conjunction with the Ninetieth Anniversary Celebration of the institute. The mechanical-engineering laboratories were open for inspection during the day and the dinner was held at Nikelous Chop House. Eleven alumni attended.

More han 70 alumni attended the Cornell University reunion on December 1, which was sponsored by the Cornell Society of Engineers. The dinner was held at the Dogwood Room of the Blackstone Hotel and after dinner the group visited the International Business Machines Selective Sequence Electronic Calculator at the IBM Headquarters.

The Georgia Institute of Technology alumni held a dinner meeting at the Engineers' Club on December 1 and 65 attended.

The University of Illinois held the alumni luncheon at the Columbia University Club on December 2, which was attended by 66 members. It was a joint meeting of ASME members and members of the New York Club of the University of Illinois. The guest speaker was M. Robert Zuppke, famous Illinois football coach.

Mechanical-engineering graduates of the University of Michigan, 43 guests, were present at luncheon held at the Engineers' Club, December 1, in honor of Dean Crawford, Professors Good, Schwartz, and White. A short movie showing the present-day Michigan campus was shown.

The University of Missouri group held their reunion dinner on November 29 at Keen's Chop House and had 10 guests.

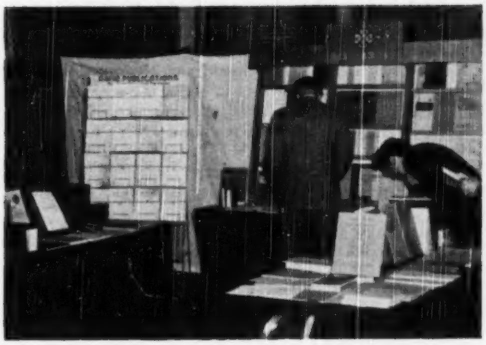
New York University reunion was held at the Chelsea Room, Governor Clinton Hotel, on December 1. There were 25 members present.

The Purdue Club of New York City held a reunion meeting at Stouffer's Restaurant on November 29, which was attended by 63 members who heard an address by Dr. A. A. Potter, dean of the school of engineering.

Rensselaer Polytechnic Institute alumni held a luncheon in the Cafe Rouge, Hotel Statler, December 1, for 25 guests.

College Reunion Night of Stevens Institute of Technology was held at the Stevens Metropolitan Club in New York, N. Y. on December 1. The schedule of events for the evening was: Cocktails at 5.30 pm; dinner, sponsored by the Stevens Metropolitan Club, at 6.30 pm; and midwinter meeting of the Alumni Association at 8 pm. Seventy guests were present.

Tufts engineers of the New York Alumni Tufts Club held a



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Random shots at the 1949 Annual Meeting

[(1) Publications sales tables at which members puchased preprints before and after technical sessions. (2) Fred H. Colvin, 1942 Worcester Reed Warner Medalist and Charles O. Herb, editor of *Machinery*, at the Machine Design Luncheon. (3) Mr. and Mrs. Frank G. Feeley enjoy Annual Banquet. (4) Dr. Gilbreth accepts certificate of the ASME Management Division from J. Keith Louden at the President's Luncheon. (5) A delegation from Milwaukee, (*left to right*) Joseph B. Armitage, Robert Cramer, Jr., George V. Miniberger, Theodore Eserkaln, and J. Verne Resek. (6) Members taking their tea and cake seriously.]

luncheon at Zeta Psi Club, New York, N. Y., on November 28, which was attended by 28 guests.

The alumni of the college of engineering of the University of Wisconsin held a dinner in the Cafe Manhattan, Hotel Statler, on December 1, which was attended by 12 members.

Worcester Polytechnic Institute held a dinner meeting at the Advertising Club, New York, N. Y., December 1. Among the guests were Rear Admiral W. T. Cluverius, president of Worcester Polytechnic Institute, and Donald Smith, secretary-treasurer of the Alumni Association of Worcester Polytechnic Institute. Seventy-five guests were present.

COMMITTEES IN CHARGE

Meetings of The American Society of Mechanical Engineers come under the general supervision of the Committee on Meetings and Program. The technical program is provided by the Society's professional divisions and technical committees. Other features are planned and supervised by committees organized within the Metropolitan Section. In grateful acknowledgment of the many committees whose efforts contributed so substantially to the success of the 1949 Annual Meeting their personnel is listed in what follows:

Meetings Committee: Glenn B. Warren, chairman, R. E. Peterson, Jos. W. Barker, Allen W. Thorson, Robert H. Bacon, with Walter H. Kassebahm, Guy W. Wilson, Rudolph Michel, J. C. Parmely, associates, and Henry J. Scagnelli and Robert C. Spencer, junior advisers.

Board on Honors: Ely C. Hutchinson, chairman, James N. Landis, director at large, Charles M. Allen, Clarke Freeman, Paul E. Holden, and Ernest L. Hopping.

Medals Committee: Ely C. Hutchinson, chairman, James N. Landis, Charles M. Allen, Nevin E. Funk, Warner Seely, Blake R. Van Leer, Joseph B. Ennis, Clarke Freeman, Benjamin P. Graves, Harry R. Westcott, Tomlinson Fort, Morrough P. O'Brien, Robert M. VanDuzer, Jr., L. M. K. Boelter, Paul E. Holden, R. J. S. Pigott, Ralph E. Turner, J. Stanley Morehouse, Ernest L. Hopping, L. F. Nenninger, and Gerald V. Williamson.

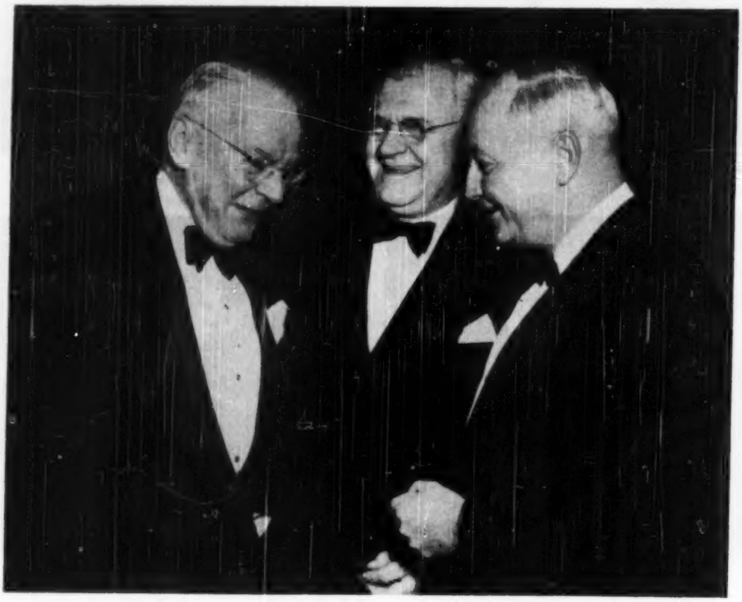
Annual Dinner Committee: R. W. Flynn, chairman, C. F. Beckwith, vice-chairman, J. W. Bennett, J. T. Costigan, and W. L. Betts.

Inspection Trips Committee: R. W. Flynn, chairman, F. A. Ritchings, Jr., vice-chairman, and M. O. England.

Ushers: Charles F. Beckwith, W. L. Betts, and H. J. Scagnelli.

Committee on Student Aides: Honorary chairmen of Metropolitan colleges, Stephen J. Tracy, Edward A. Boguez, Jas. R. Randolph, Wm. R. MacCrehan, and Wm. R. Ruten.

Committee on Women's Activities: Mrs. Frank N. Miller, honorary chairman, Mrs. H. R. Kessler, general chairman, Mrs. C. H. Kent, general vice-chairman; Mrs. Crosby Field, Mrs. Harold Erb, Mrs. H. R. Kessler, Mrs. T. A. Burdick, Mrs. C. H. Kent, Mrs. N. Dahl, Mrs. J. Kirby, Mrs. Sabin Crocker, Mrs. C. F. Kayan, Mrs. E. A. Lundstrom, Mrs. J. H. Hochuli, Mrs. T. A. Burdick, and Mrs. W. L. Iliff.



Left to right, JAMES D. CUNNINGHAM, PRESIDENT, REPUBLIC FLOW METERS CO., CHICAGO, WHO WILL TAKE OFFICE AS PRESIDENT OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS IN 1950; CLARENCE E. DAVIES, ASME SECRETARY, AND JAMES M. TODD, CONSULTING ENGINEER OF NEW ORLEANS, LA., ASME 1949 PRESIDENT. THEY ARE PICTURED AT THE ASME 70TH ANNUAL MEETING IN THE HOTEL STATLER, NEW YORK, N. Y.

ASME HONORS ENGINEERS

Biographies of Recipients of Honorary Membership and Awards at the 1949 ASME Annual Meeting

EVERY year The American Society of Mechanical Engineers honors distinguished members of the engineering profession by the presentation of certificates of honorary membership and the prizes and awards that have been instituted from time to time during the course of the Society's existence. The bestowal of these certificates, prizes, and awards is a colorful feature of the ASME Annual Dinner where the attendance this year exceeded 1300 persons. A description of the dinner and a list of the recipients of honorary-membership certificates, prizes, and awards will be found on pages 59–62 of this issue. In the following pages brief biographies are presented so that members of the Society may know what manner of men they have honored, and how signally they have honored their Society by recognizing outstanding and specific achievements.

HONORARY MEMBERS

ALEX DAVISON BAILEY

ALEX DAVISON BAILEY, Fellow ASME, vice-president of the Commonwealth Edison Company, Chicago, Ill., was born in Kenosha County, Wis., in 1882 and was graduated with an ME degree from Lewis Institute in 1903. In 1942 Northwestern University conferred on him the honorary degree of doctor of science.

Starting with Commonwealth Edison in 1903, Mr. Bailey successively held the positions of chief engineer of the Fisk and Quarry Stations, superintendent of generating stations, chief operating engineer, assistant to vice-president, and since 1944 has been vice-president. He has contributed to many improvements in the design and operation of special equipment and to advances in operating practices. He has been a member and chairman of many important operating and research committees in the Association of Edison Illuminating Companies, National Electric Light Association, and Edison Electric Institute.

Keenly interested in engineering education he has frequently addressed college students on its broader aspects in the interest of better citizenship. For nearly four years he was chairman of the Board of Trustees of Lewis Institute and since its merger with Armour Institute in 1940, has been vice-chairman of the Board of Trustees of the Illinois Institute of Technology.

Since he became a junior member in 1910, Mr. Bailey has worked ardently for the advancement of The American Society of Mechanical Engineers. In 1918 he was chairman of the ASME Chicago Section. He has served the Society directly in many capacities: chairman of the Power Division, delegate to the International Fuel Conference, London, England, 1928; chairman of the Standing Committee on Research; Manager; chairman of the Special Council Committee; member of the Advisory Board on Codes and Standards, vice-president, and president in 1945.

OLIVER VAUGHAN SNELL BULLEID

OLIVER VAUGHAN SNELL BULLEID, consulting mechanical engineer, Coras Iompair Eireann (Irish Transport Undertaking), Inchicore Works, Dublin, Eire, was born in Invercargill, New Zealand, 1882. He was educated in the technical schools of Great Britain.

He has had a brilliant career in railroad-equipment engineering. By accomplishment and example he has given a new impetus and direction to locomotive and car design in Great Britain and is regarded as an authoritative leader in the industry.

His industrial career began in January, 1901, as a premium apprentice at the Doncaster Works of the Great Northern Railway where he gained experience in the railway's shops, drawing office, and running sheds. Four years later he was appointed assistant to the locomotive-running superintendent and carried out experiments on petrol motor-driven passenger railcar coaches. His association with Great Northern continued until 1927, except for the years he served in The Army Service Corps during World War I, after which he resumed his old post as assistant to the locomotive engineer of the company. A year later he became assistant carriage and wagon-works manager and in February, 1923, he commenced his long association with the late Sir Nigel Gresly, as assistant to the chief mechanical engineer of the London and North Eastern Railway, which ended with his appointment in 1937 as chief mechanical engineer of the Southern Railway.

Mr. Bulleid is responsible for the "Merchant Navy" class locomotive and the "West Country" type. These two classes work all the heavy high-speed trains and have eliminated double heading. He has also introduced many innovations into the construction of railway coaches on British railways; freight cars; and reinforced plastic for bodies of covered goods cars.

During World War II, Mr. Bulleid was appointed chairman of the Mechanical and Electrical Engineers' Committee of the British Railway Executives, and has occupied that position to the present time. In 1945 Mr. Bulleid was appointed adviser to the Minister of Transport on the use of the British locomotive and car works and depots in making up the arrears of maintenance of railway locomotives and other rolling stock which accumulated during the war.

Mr. Bulleid served as president of the Institution of Locomotive Engineers from 1939 to 1944. He was also elected president of The Institution of Mechanical Engineers in March, 1946. His paper on "The 'Merchant Navy' Class Locomotives of the Southern Railway" was presented at the Institution's General Meeting, December, 1945; in 1944, in his annual lecture to the graduates of The Institution of Mechanical Engineers his paper entitled "Locomotives I Have Known" surveyed the many locomotive types he has been associated with in his long career.

SAMUEL WILLIAM DUDLEY

SAMUEL WILLIAM DUDLEY, dean-emeritus of the School of Engineering, Yale University, New Haven, Conn., was born in New Haven, on Oct. 18, 1879. He received a PhB degree from Sheffield Scientific School, Yale University, with honors in mechanical engineering, in 1900; three years later he was granted an ME degree by the same school, and joined the engineering staff of the Westinghouse Air Brake Company.

He made notable contributions to the development of the air brake and in 1914 became chief engineer of the company, in which capacity he served until 1921. In February of that

Made Honorary Members of the ASME

ALEX DAVISON BAILEY
Honorary Membership

OLIVER VAUGHAN SNELL BULLEID
Honorary Membership

SAMUEL WILLIAM DUDLEY
Honorary Membership

ROY CUMMINGS MUIR
Honorary Membership

D. ROBERT YARNALL
Honorary Membership

year Dr. Dudley was called to Yale as Strathcona Professor of Mechanical Engineering, and in 1923 was elected chairman of the department of mechanical engineering. He was appointed dean of the engineering school at Yale in 1936, serving as dean until his retirement in 1948.

During World War II the large enrollment of Navy students called for a high degree of administrative skill in co-ordinating the Navy educational programs with those of the university. Dean Dudley was successful in harmoniously fulfilling the requirements of the Navy and that concept of engineering education which is characterized by the emphasis on basic fundamentals and the development of character and leadership.

In his capacity as honorary chairman of the ASME Yale student branch and as an ever-accessible personal counselor, Dean Dudley helped hundreds of students along the path of professional growth.

Dean Dudley has made notable contributions also in the development of The American Society of Mechanical Engineers, serving on the Council and on many of its important committees. He was chairman of the committee on the Fiftieth Anniversary Celebration of the Society. He is the author of numerous papers, has received many honors, in 1941 became Fellow ASME, and in 1943 was awarded the honorary degree of Doctor of Engineering by Clarkson College of Technology, Potsdam, N. Y.

ROY CUMMINGS MUIR

Roy Cummings Muir, vice-president and general manager of the apparatus department, General Electric Company, Schenectady, N. Y., was born in Arcadia, Wis., on Dec. 30, 1881. He received the degree of BSEE in 1905 from the University of Wisconsin.

Mr. Muir has had a long and useful career as an engineer; his entire professional life has been with General Electric. His life within the company followed constantly broadening paths. He was in the design-engineering department, the commercial-engineering department; he was with the International General Electric Company on the staff of the vice-president in charge of engineering.

In May, 1934, he was elected vice-president in charge of engineering, a position which carries with it the responsibility for the operation and activities of the engineering department of the company. In October, 1941, he was appointed a member of the president's staff, to assist the president in general matters relating to engineering. He was constantly occupied with the many important engineering problems pertaining to General Electric Company's tremendous contribution to the war effort. He was head of the engineering council and was on the general-operations committee. He was recalled from retirement to take charge for a time of the nucleonics department of the General Electric Company.

Mr. Muir was also chairman of the education committee of the company, which directs the recruiting of technical and business graduates and exercises a guiding hand on the extensive personnel training programs fostered by the company. He has been a member of New York State Regents Council on Apprentice Training for many years; he is a Trustee of Union College, and a member of the Board of Education of the City of Schenectady.

In 1942 Manhattan College conferred on him the honorary degree of doctor of engineering.

Mr. Muir has been active in the American Institute of Electrical Engineers and The American Society of Mechanical Engineers. He was at one time chairman of the ASME Schenectady Section. He has made considerable contribution to the work on management in the Society. He was a member of the ASME Medals Committee and Board on Honors. He served on the War Production Board. In 1941 he became Fellow ASME. He is the author of many technical papers.

D. ROBERT YARNALL

D. Robert Yarnall, Fellow ASME and past-president, 1946; president of Yarnall-Waring Company, Philadelphia, Pa., was born in Middletown, Pa., in 1878. From the University of Pennsylvania he received the degrees of BSME, 1901, and ME, 1905.

In 1905 Mr. Yarnall went with the Coatesville Boiler Works and allied companies as an engineer, remaining five years. For a like period and in a like capacity, he was with Stokes and Smith Company. From 1912 to 1918 he was vice-president and general manager of the Nelson Valve Company. In 1908, with B. G. Waring, he organized the Yarnall-Waring Company in Philadelphia to manufacture power-plant specialities. Now as president he devotes most of his attention to this company, but he is also a director and president of James G. Biddle Company in Philadelphia, manufacturers of electrical instruments.

Mr. Yarnall represented the ASME as director and chairman of the Committee on Public Affairs of the American Engineering Council. He has been a director and vice-president of the Engineering Foundation; member, ASME, since 1911, he became Fellow in 1936, manager, 1917–1920; president, 1946. He is a trustee of The Franklin Institute; president, Engineers Club of Philadelphia; vice-president and director of the American Friends Service Committee, and president of the United Engineering Trustees.

In 1941 he was awarded the Hoover Medal, and the following year the honorary degree of doctor of engineering was conferred on him by Lehigh University. He is a member of the Society of Sigma Xi.

RECIPIENTS OF MEDALS AND AWARDS

ASME MEDAL 1949

Fred L. Dornbrook, general consultant, power-plant department, Wisconsin Electric Power Company, Milwaukee, Wis., was born in Brandon, Wis., April 4, 1875. He attended the public schools of Brandon.

Early experience with power-generating equipment started at the age of 22, when he became a coal passer on a boat plying the Great Lakes. Merit advanced him successively to fireman, oiler, and then assistant engineer at the age of 26, when he commenced work with Wisconsin Electric Power Company in 1901.

A year later he was made engineer-in-charge of his company's major plant and in 1914 he was put in charge of all steam-plant operation and maintenance. In 1925 he was appointed chief engineer of power plants, which put him in charge of the design and construction of the Lakeside and Port Washington Stations and of extensions to the Commerce Street and E. Wells Street plants. In January, 1949, he relinquished these duties and was appointed general consultant, power-plant department.

Mr. Dornbrook's contribution to the development of the modern steam power plant has been outstanding. He has made many contributions gained from his experience in the operation of power plants during his many years of active work. These contributions are not limited to the steam turbine but include the power plant and machinery of various types. It was in the development of the burning of pulverized fuel in boilers, however, that he made his greatest contribution. This development began in 1918 when an experimental installation was made in the Oneida Street Power Station of The Milwaukee Electric Railway and Light Company, now the Wisconsin Electric Power Company. The result of this development was the adoption of pulverized-coal burning for all new power plants of the company. Not only that, but practically all large power plants throughout the world using coal for fuel adopted this system of firing.

To Mr. Dornbrook belongs the main credit for economy records of the Port Washington plant of the Wisconsin Electric Power Company.

He has been a member of The American Society of Mechanical Engineers since 1922.

WORCESTER REED WARNER MEDAL

Fred B. Seely, head of the department of theoretical and applied mechanics at the University of Illinois, was born April 29, 1884, in Chester, N. Y. He was graduated from Worcester Polytechnic Institute in 1907 with a BS degree in mechanical engineering.

After two years of engineering practice he accepted an instructorship in theoretical and applied mechanics at the University of Illinois where he has served continuously to the present date, having been appointed a full professor in 1921. During this period, in addition to his teaching, he carried on research in the properties of materials and in hydraulics and did much writing. He also developed a number of advanced courses in the mechanics of materials. He served with distinction as chairman and member of many college and university committees.

Since 1934, as head of the department, he has been in charge of teaching and research in engineering mechanics and materials and in hydraulics, during which time graduate work and research were greatly expanded.

He is the author of three books and many technical articles. The books are "Analytical Mechanics for Engineers" (coauthor with N. E. Ensign), first published in 1921; "Resistance of Materials," first published in 1925; and "Advanced Me-

Recipients of Medals and Awards

FRED LUDWIG DORNBROOK
ASME Medal

FRED B. SEELY
Worcester Reed Warner Medal

HAROLD BRIGHT MAYNARD
Melville Medal

ARTHUR M. WAHL
Richards Memorial Award

PHILLIP SAMUEL MYERS
Pi Tau Sigma Gold Medal Award

JOHN CROCKER FISHER
Alfred Noble Prize

chanics of Materials," published in 1932. These books by their completeness, clarity of presentation, and extensive use have helped to set a new pattern of thought and teaching in engineering education in the fields of mechanics and strength of materials.

He has served on committees of the ASME, American Society for Testing Materials, and the American Society for Engineering Education.

MELVILLE PRIZE FOR ORIGINAL WORK

HAROLD BRIGHT MAYNARD, founder and president of the Methods Engineering Council, Pittsburgh, Pa., was born in Northampton, Mass., Oct. 18, 1902. He was graduated from Cornell University in 1923 with a degree of ME. His first six years in industry were spent with the Westinghouse Electric Corporation. At the time of his resignation, he was superintendent of production of the Steam Division, South Philadelphia, Pa.

After a period of preparation he organized the Methods Engineering Council in 1934. Since that time his major activities have been devoted to the development of sound management practices in business and industry.

He is well known to industry as a consultant in industrial management, for his authorship of many widely used technical books and training courses, and for his active participation in management societies.

He served as national president of the Society for the Advancement of Management, 1946–1947, and was its delegate to the International Management Congress in Stockholm, Sweden, during July, 1947.

He is serving his second term as president of the National

Management Council and has made several trips to Europe as the council's representative at the International Committee of Scientific Management Executive Committee Meeting.

He is a member of the American Management Association, the American Arbitration Association, the Association of Consulting Management Engineers, and The American Society of Mechanical Engineers, where he has been active on management committees within the Society.

In 1946 Mr. Maynard was honored by the Society for the Advancement of Management when he was awarded the Gilbreth Medal for his contribution to industrial engineering. He was selected in 1948 by The American Society of Mechanical Engineers as the Henry Robinson Towne Lecturer. His paper is entitled "The Role of Scientific Management in World Recovery" (see MECHANICAL ENGINEERING, March, 1949, vol. 71, no. 3, pages 229–231).

RICHARDS MEMORIAL AWARD

ARTHUR M. WAHL, advisory engineer, Westinghouse Research Laboratories, was born in Churdan, Iowa, in 1901, and was graduated from Iowa State College in 1925 with the degree of BSME. In 1925 he went to Westinghouse Electric Corporation as a graduate student and since 1926 has been at the Research Laboratories specializing in mechanical-engineering and applied-mechanics problems, particularly in the field of stress analysis of machine parts. In 1927 he received an MS degree and in 1932 a PhD degree from the University of Pittsburgh. He was awarded the ASME Junior Award in 1929, for his paper on "Stresses in Heavy Closely Coiled Helical Springs."

Mr. Wahl is the author of "Mechanical Springs," published in 1944 and a section in Marks's "Mechanical Engineers' Handbook," 1941 edition. He has contributed approximately fifty articles to the technical press on mechanical-engineering and applied-mechanics subjects during the past 22 years. He is a member of Tau Beta Pi, Phi Kappa Phi, The American Society of Mechanical Engineers, American Association for the Advancement of Science, and the Society for Experimental Stress Analysis.

Technical-society committees on which he has served include: ASME Special Research Committee on Mechanical Springs; SAE War Engineering Board Spring Committee; SAE Technical Board Spring Committee, and Pressure Vessel Research Committee of the Welding Research Council.

PI TAU SIGMA GOLD MEDAL AWARD, 1949

PHILLIP SAMUEL MYERS, assistant professor, mechanical-engineering department, University of Wisconsin, was born in Webber, Kan., in 1916 and in 1940 earned his first degree, BS in Commerce and Mathematics, at McPherson (Kan.) College. To continue his education he became a research assistant in the department of applied mechanics at Kansas State College in 1940 and in 1942 he received the degree of BSME with honors.

He was an instructor in mechanical engineering at Indiana Technical College during the summer of 1942. In the fall he went to the University of Wisconsin, where he was engaged for the same work, and did research which led to his receiving a PhD in mechanical engineering in 1947 and his appointment as assistant professor of mechanical engineering.

Mr. Myers's field of special interest has been combustion in internal-combustion engines and, with his associates in research, he has made notable contributions to technical literature which were published in Transactions ASME, Transactions SAE, and others. He is a member of Pi Tau Sigma, Sigma Xi, Sigma Tau, Phi Kappa Phi, Blue Key, The American Society of Mechanical Engineers, and the Society of Automotive Engineers.

ALFRED NOBLE PRIZE

JOHN CROCKER FISHER, research associate at the General Electric Research Laboratory, Schenectady, N. Y., was born in Ithaca, N. Y., in 1919. Following his graduation from Ohio State University with the degree of BA in mathematics in 1941, he spent a year at the Battelle Memorial Institute as research engineer. From 1942 to 1947 he was an instructor in mechanical engineering at the Massachusetts Institute of Technology. Since that time he has been with the General Electric Company in Schenectady, N. Y.

His paper entitled "Anisotropic Plastic Flow," for which he is being awarded the Alfred Noble Prize, was presented at the Semi-Annual Meeting of the Society in Milwaukee, Wis., 1948, published in Transactions of the ASME, May, 1949, vol. 71, no. 4, pages 349–356.

Mr. Fisher, Mem. ASME, 1946, is also a member of many honorary technical societies. He is the author or coauthor of numerous papers in the field of metallurgy and mechanics of material. In 1947 he was awarded the ScD degree.

DANIEL GUGGENHEIM MEDAL FOR 1950

"Pioneering in research and a continuous record of contributions to the art and science of aeronautics," has earned for EDWARD PEARSON WARNER the Daniel Guggenheim Medal for 1950.

Mr. Warner was born in Pittsburgh, Pa., in 1894. He received his education at Harvard University and Massachusetts Institute of Technology. During World War I he taught aeronautical engineering at M.I.T. and later served as chief physicist with the National Advisory Committee for Aeronautics in charge of research at the station which the NACA had just established at Langley Field, Va.

In 1920 he returned to M.I.T. to take charge of teaching aeronautical engineering, becoming a full professor in 1924. Recognized as an authority in aviation policy, he was called upon by the Massachusetts legislators to help in drafting early laws affecting the aviation industry. His recommendations to the Federal Government led to the appointment of a special assistant for aeronautics in the War, Navy, and Commerce Departments. In 1926 he received the first such appointment in the Navy Department.

He resigned his government post in 1929 and became editor of *Aviation* for five years, continuing his public and organizational activities. From 1929 to 1945 he was a member of NACA. Since 1947 he has devoted his energies to the task of president of the International Civilian Aviation Organization which is concerned with the technical, regulatory, and administrative problems involved in world air navigation.

While at M.I.T. he wrote "Aerostatics" (1926) and "Aeroplane Design—Aerodynamics" (1927). The latter became widely used as a textbook and was awarded a medal by the Aero Club of France.

In 1938 he lectured at Norwich University, Northfield, Vt., where he received the honorary degree of doctor of science. That year he became economic and technical consultant to, and shortly became a member of, the Civil Aeronautics Authority. On this and its successor, the Civil Aeronautics Board, he served six years, during which time he made serveral trips to England on Government missions.

In 1943, when he delivered the Wilbur Wright Lecture to the Royal Aeronautical Society, he was made an honorary fellow. In 1945 he also received honorary fellowship in the Institute of Aeronautical Sciences. In 1948 he was elected an honorary fellow of the Aeronautical Society of India; and in the same year, during a visit to Lisbon, the Portuguese government conferred on him the Military Order of Christ.

Recipients of Medals and Awards

EDWARD PEARSON WARNER
Daniel Guggenheim Medal

ARTHUR CLINTON SPURR
Henry Laurence Gantt Memorial Gold Medal

STANLEY MARKOFF KOVACHEFF
Charles T. Main Award

DANIEL ROBERT FISHER
Postgraduate Student Award

GEORGE DAVENPORT LEWIS
Undergraduate Student Award

He was president of Society of Automotive Engineers in 1930, and in 1932 he received the Wright Brothers Medal from SAE. He has been a member of The American Society of Mechanical Engineers since 1928.

HENRY LAURENCE GANTT MEMORIAL GOLD MEDAL

ARTHUR CLINTON SPURR, president, Monongahela Power Company, Fairmont, W. Va., was born in Valley City, N. D., in 1889. He has two degrees from Yale University, LLB in 1910, AB in 1913. Waynesburg (Pa.) College conferred on him the LLD degree in 1941.

For four years following his graduation from Yale he was with the Baltimore and Ohio Railroad. Then successively, he was traffic manager of the East Coast Fisheries, 1919–1920; consulting engineer and research manager for Pittsburgh Railways, 1920–1925; vice-president, Wheeling Traction Company, 1925–1931; president, Blue Ridge Lines, 1931–1933; assistant to the president, West Penn Electric Company, 1934; and since 1935 he has been president of Monongahela Power Company and affiliate utilities.

Mr. Spurr initiated the program of the Upper Monongahela Valley Association for northern and central West Virginia to improve conditions in the five major community interests—agriculture, industry, commercial service, recreation, and housing; and the power company created a territorial-development department.

High lights of the results of the project in the last decade are: In the first year the program had enrolled 287 farm families; in 1949 approximately 1800 were participating; the Fairmont field has a new potential market for two million tons of coal; manufacturing pay rolls increased by at least $30,000,000 in the last seven years; and improvements are reflected upward from

individuals to companys to the number of communities in the surrounding territory which have joined the program.

The intangible gain is the changed morale of the people working under the leadership of an industrialist who has assumed community responsibility.

CHARLES T. MAIN AWARD

STANLEY MARKOFF KOVACHEFF was born in Niagara Falls, N. Y., in 1925. His schooling was interrupted in 1932 when the family moved to Detroit, Mich., where he attended the Garfield Elementary and Intermediate School, graduating in 1940. Taking the electrical course at Cass Technical High, he was graduated in 1943. For a year he was employed by the Lee Engineering Company and then entered the engineering school of the University of Detroit, earning his way by part-time employment. He was graduated from the university with the BME degree.

Mr. Kovacheff is a junior member of ASME. His paper entitled "The Increasing Importance of Science in Engineering" has won for him the Charles T. Main Award.

POSTGRADUATE STUDENT AWARD

DANIEL ROBERT FISHER was born in Philadelphia, Pa., May 23, 1925, graduated from Abington (Pa.) High School in 1942. He received a BME degree from Rensselaer Polytechnic Institute, Troy, N. Y., in 1945 and a MME in 1949. He participated in naval ROTC at RPI from 1942 until February, 1945, when he received his ensign's commission. He was instructor in mechanical engineering at RPI from September, 1946, until June, 1949.

He served with the Navy in the Atlantic area and later in the Pacific area aboard the destroyer U.S.S. *Hanson* along the Japanese coast, aiding in the demilitarization of Japanese shipping and in patrol and rescue work.

Since June 22, 1949, Mr. Fisher has been civilian training officer in charge of mechanical-engineering courses at the Ordnance School, Aberdeen Proving Ground, Md. He won the Postgraduate Student Award for his thesis on "The Effect of Evaporative Cooling on a Compressible Fluid Flowing in a Duct."

UNDERGRADUATE STUDENT AWARD

GEORGE DAVENPORT LEWIS was born in Shelton, Conn., 1924. He was graduated from the Shelton High School in 1941 and then from the U. S. Merchant Marine Cadet Corps. After spending nearly four years in the Merchant Marine (now holds a maritime license as second mate) he entered the University of Connecticut from which he was graduated with highest distinction in mechanical engineering, June, 1949.

He is president of the local honorary society Alpha Tau Phi, and is the first president of the Connecticut Beta Chapter of Tau Beta Pi. He was editor of the *Connecticut Engineer*, 1947-1948. He won first prize in the 1949 ASME Region I technical-paper contest with his paper entitled "Some Natural Limitations on Space Travel." This same paper won for him the Undergraduate Student Award.

PRESIDENT-ELECT JAMES D. CUNNINGHAM AND MRS. CUNNINGHAM ARE GREETED BY WELL WISHERS AT THE PRESIDENT'S RECEPTION

ASME 1949 ANNUAL MEETING PREPRINTS

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COMMENTS ON PAPERS

Including Letters From Readers on Miscellaneous Subjects

Apprenticeships and Industrial Management

Comment by L. G. Cattermole[1]

Throughout this paper[2] and the one preceding[3] there seems to run a dominant "C," which is the development of various techniques that will enable a business to perpetuate itself.

It would seem that a sound and healthy philosophy is evolving in American industry, and is being shaped by practical considerations. The leaders in the development of our philosophy and its application appear to be some of the larger corporations. This may be due to the fact that their managers are hired employees, and the large corporations have the ability, in many cases, to hire the broadest-gaged, and farthest-sighted individuals. Of course, too, the larger corporations are usually the more articulate, and have the means whereby their ideas may be widely publicized.

The previously expressed criticism, and one frequently leveled at business, that payment of dividends to shareholders is per se the prime objective of business, cannot be considered either justified or fair. The primary goal of business is self-perpetuation. Self-perpetuation is necessary for the purpose of enabling any company or business establishment to discharge its obligation to its employees in the form of providing a continuous livelihood and an opportunity for advancement. Self-perpetuation is necessary to enable a business to discharge its obligation to the community, as the community, any community, is dependent for its welfare upon the businesses within its confines; the retail stores, the wholesale houses, the town or city activities are dependent upon the continuity of operation of each and every business. So also is self-perpetuation essential to the economic welfare of the state and nation—in fact to the economic welfare of humanity.

It must be recognized that self-perpetuation is dependent upon fair and reasonable profits. Consider a small manufacturing establishment with a net worth of $500,000. At least 10 per cent of that net worth should be provided yearly, in the form of profits, for growth. That amounts to $50,000. Capital is necessary to enable a business to get started, and should get a reasonable return, say, 5 per cent of the net worth, or $25,000 in this case. Therefore, a profit of $75,000 after federal taxes should be expected, and planned. With a federal tax of 38 per cent, a profit of nearly $125,000 before federal taxes is required. If an average of 5 per cent net profit on sales is experienced, then about $2,500,000 sales would be required, annually, on a net worth of $500,000.

This may possibly account for the emphasis on techniques rather than upon philosophies—each business is so engaged in keeping its head above water that it is necessary to confine its activities to the endeavor to preclude a loss.

It takes time, a certain amount of leisurely meditation, and considerable thought to develop a sound philosophy; it takes time and the cultivation of receptive and fertile soil to permit the seeds of a philosophy to sprout and grow, and eventually serve as the foundation for the superstructure of sound leadership and sound labor-management relations.

In this respect we seem to be heading, slowly, in the right direction. These apprenticeship-for-leadership methods and procedures are fine. They are helpful for the self-perpetuation of business. But these techniques still seem to fall far short of helping to create that attitude of mind, to cultivate that ability to deal with human relationships, that makes men "big" in mental stature and vision.

It is, therefore, essential that we endeavor to imbue the young potential leaders with the importance, not only of discharging their responsibilities to the companies with which they are affiliated, but also to the communities in which they are located, and in helping to evolve a practical philosophy which may enable humanity to go forward to its material and spiritual betterment.

[1] L. G. Cattermole and Associates, Springfield, Mass. Mem. ASME.

[2] "Apprenticeships in Manufacturing Management," by A. V. Feigenbaum and H. W. Tulloch, Mechanical Engineering, August, 1949, vol. 71, pp. 659–662.

[3] "The Development and Application of Communications Techniques in Labor-Management Relations."

Authors' Closure

Were we to interpret the apparatus department's manufacturing leadership program as a means of self-perpetuation narrowly confined to the business internally, it would fail to do justice to the extensive interests of the General Electric Company and its people in participation and service in community activities. Through their "personal apprenticeship" relations with the older managers, a very large number of whom actively pursue these community activities in many forms, the young manufacturing leadership program men are, through actual practice, perhaps brought closer to the philosophy of service than might be possible were this service concept brought out only through formal classroom discussion.

The real social and community responsibility of business must be of paramount importance in the modern industrial world; our manufacturing training programs endeavor to give basic recognition to these responsibilities.

A. V. Feigenbaum.[4]
H. W. Tulloch.[4]

[4] Manufacturing Staff, Apparatus Dept., General Electric Company, Schenectady, N. Y.

Radiation Instruments

Comment by Ernest H. Wakefield[5]

E. W. Molloy and A. O. Beckman have presented a most able discussion on the broad field of radiation instruments.[6]

However, it seems to the writer that this paper leaves in the mind of the reader the possible misconception that such instruments go to make up the bulk of the equipment in this field. As is well known, this is not the case. A typical laboratory for research work probably would need to allocate for instruments and immediate accessories for the measurement of radioactivity some $3500, of which the health-protection, surveying, and monitoring equipment would

[5] Director, Radiation Counter Laboratories, Inc., Chicago, Ill.

[6] "Modern Radiation-Detection Instruments for Health Protection," by E. W. Molloy and A. O. Beckman, Mechanical Engineering, August, 1949, vol. 71, pp. 649–655.

require between $500 to $1000, the balance being expended for quantitative measurement instruments.

Another point to be raised is the rather cavalier treatment by the authors of the possible use of scintillation counters in which the kinetic energy of the radiation is transformed into photons which in turn strike photosensitive cathode surfaces which eject electrons. These electrons in turn are increased in number through successive multiplication stages. The fact that such scintillation crystals are rather dense, which gives unusually high efficiency for detection of gamma radiation, and are, of course, efficient for alpha and beta detection, leads one to believe they have great possibilities. In addition, neutrons also can be detected through proton recoils or possible emission of alphas by insertion of boron compounds in these crystals. Such a detector leads to a universal instrument and enables one to have high hopes for health-monitoring equipment based upon the scintillation counter.

The writer does not wish to detract from the excellent paper by the authors, but it seems that these two points should be brought more fully to the attention of the engineering profession.

AUTHORS' CLOSURE

We agree with Mr. Wakefield that health-protection instruments constitute only a part of the complete instrumentation of a radiation laboratory and that "high hopes for health-monitoring equipment based upon the scintillation counter" may well be held. We respectfully point out, however, that our paper, as defined in the title and introductory paragraph, is concerned only with health-protection instruments which are currently available. Instruments for purposes other than health protection and instruments which are not yet commercially available fall outside the scope of the paper. We hope that we will not be unduly censured for staying within the bounds of our subject.

E. W. MOLLOY.[7]
A. O. BECKMAN.[7]

[7] Instrument Division, National Technical Laboratories, South Pasadena, Calif.

REVIEWS OF BOOKS

And Notes on Books Received in the Engineering Societies Library

Bottom-Up Management

BOTTOM-UP MANAGEMENT. By William B. Given, Jr. Harper and Brothers, New York, N. Y., 1949. Cloth, $5^1/_4 \times 8$ in., ix and 171 pp., $2.50.

REVIEWED BY DEXTER S. KIMBALL[1]

THIS book is a "case history" of an experiment in what the author calls "human relations" rather than "labor relations." The author, Mr. William B. Given, is president of the American Brake Shoe Company, an organization which has 58 industrial plants in the United States, Canada, and France. He writes therefore about actual performances and not from theoretical considerations. Mr. Given's thesis in brief is that the combined judgment, initiative, enterprise, and creativeness of a business organization produce better results in progress and profits than does the autocratic administration of a single individual. And he notes that this principle is becoming increasingly important in view of the growing trend toward decentralization in many industries. And underlying it all is the increasing importance of the individual as such and the growing belief that industry was made for man and not man for industry.

As he notes, there is nothing radically new in the philosophy of broadening the base of management to include even actual workers. Indeed there has been much written on the subject and many experiments in democratic management ranging all the way from the short-lived plans of "Industrial Democracy" based on the writings of John Leitch of thirty years ago to the plan of "Multiple Management" now in operation at the plant of McCormick and Company of Baltimore, Md., and elsewhere. It is a problem that will remain with us as long as the majority of the workers are separated from the ownership of industry. Mr. Given in this book presents his own experiences in meeting this problem. Perhaps he has pushed responsibility a little farther down the line than is customary where he empowers his superintendent, "assisted by his chief clerk and a foreman or two," to negotiate his own union contracts.

Mr. Given has no illusions concerning labor unions. He accepts them as part of modern industry, and most of his plants are organized. He accepts collective bargaining, tries to deal fairly with his men, and expects to be fairly treated in return. And he is equally clear and insistent that divided responsibility can in no way take the place of leadership and vision on the part of those directing the plant.

One of the most interesting chapters is "The Family Is Important." In the old days, especially in New England where plants were small, the employer often took a lively interest in the families of his employees. These pleasant relations have been largely lost in the great industries of today. Yet an interest in the employee outside of his factory hours may pay good dividends. Not the least important feature of this book is the kindly, progressive, and human warmth which illuminates his discussion. Perhaps we need more men of his kind in industry.

[1] Dean Emeritus, College of Engineering, Cornell University, Ithaca, N. Y. Past-President and Honorary Member ASME.

Technical Sketching and Visualization

TECHNICAL SKETCHING AND VISUALIZATION FOR ENGINEERS. By Hyman H. Katz. The Macmillan Company, New York, N. Y., 1949. Cloth, $7^1/_2 \times 10$ in., diagrams, figures, 163 pp., $5.

IN creative engineering it is not long before a new idea finds itself confronted by its first crucial test. It must survive transmission from the mind of the creator, who may be completely at home in his field, and materials to the mind of the administrator, who, preoccupied with managerial functions and no longer agile in visualizing complex mechanisms, must yet pass judgment on the new idea.

For the task of conveying engineering ideas, words are usually dull tools and the engineer who must hazard his idea solely to the uncertainties of the spoken or written word, is severely handicapped. For the failing of words is their inefficiency. So many of them must be called into play simply to convey the mental image of a plate with several holes of different diameters in it. In such an operation each word is like the pieces of a jig-saw puzzle, each contributes something to the whole mental image but the final image transmitted is not so much the work of the mind which produces the pieces as that of the one who assembles them.

In the mysterious process of communicating ideas, mental images which have come into focus in the mind's eye must be broken down into words and these transmitted to the recipient mind as sound. The process is completed when the sound has been identified as words, and these are used to reconstruct a replica, usually imperfect. Compared to the lines of a technical sketch this process is as direct as a trip from New York to San Francisco by way of China.

From the stress placed on drawing and sketching in engineering schools, it is obvious that engineers are quite aware of the power of sketches to convey mechanical ideas. This appreciation may underlie the common observation that engineers generally neglect the art of writing or at least are not as assiduous in its cultivation. It is doubtful, however, whether they appreciate fully the potentialities of technical sketching and visualization as a technique for invention, interpretation of designs, planning, transmittal of orders, and salesmanship.

The book under review is not so much a textbook as it is a treasury of ideas on how sketching can be applied to evoke ideas in the act of invention, transmittal of ideas involving complex mechanisms, as a device for avoiding verbal orders, and a technique for analysis, computation, and interpretation of designs. The book is replete with hundreds of sketches which teach how to draw. Many of these are exciting in the sense that they inspire the development of nascent talent.

Young engineers who are beginning to forget they once took a course in sketching and are growing complacent and satisfied with mediocre sketches may find in the book the impetus to devote some of their spare time to brushing up on a skill which offers all the rewards and satisfactions of a hobby. They may learn that a complicated casting which satisfies their engineering sense of simplicity, economy, and beauty, can be reproduced as a sketch which some of their friends may want to frame.

As the work of an engineer who is also an artist, as some of his sketches attest, this book is recommended to all engineers who work with mechanical designs or who have engineering ideas to sell.—A. F. B.

The Abuse of Learning

THE ABUSE OF LEARNING: The failure of the German university (1810-1845). By Frederic Lilge. The Macmillan Company, New York, N. Y., 1948. Cloth, $5^1/_2 \times 8^1/_4$ in., vi and 184 pp., $2.75.

REVIEWED BY A. A. POTTER[2]

THE AUTHOR, a professor of the history and philosophy of education at the University of California, appraises in this book the causes which undermined German higher education and made it a tool of the Nazi State.

During the eighteenth century, intellectual life in German universities was at a low ebb. While now and then some recognition was given that good teaching and independent inquiry supplement and even require each other, the majority of professors felt that truth was something already known and that teaching consisted merely of handing it on to the next generation.

Throughout most of its history, the German government regarded universities as territorial possessions intended to work for the enhancement of national prestige, expecting them to train an efficient and well-informed officialdom interested in the development of the military and industrial enterprises of the State. Education was treated as the affair of the State, subordinating individual rights and with too little freedom for philosophical inquiry.

Now and then humanists, like Humboldt and Goethe, proclaimed that the cultivation of human individuality is the supreme aim of education. Humboldt, in particular, decried the use of citizens as mere instruments with which to obtain national power, prosperity, and efficiency, and felt that reliance on State welfare and services destroys men's independence. Goethe, Schiller, and Hegel stressed the value of philosophy as a basis for a general education, but many more of the other great minds of Germany felt that "once man begins to philosophize he loses his original innocence." Treitschke believed in a long working day for the workers, feeling "that there is no culture without servants" and that the working people must be kept ignorant or the education of the higher classes will become impossible. Boastful nationalization permeated even the great of Germany like Fichte.

Naturphilosophie, which refused to make use of observation and experiment, had hold of the German thinking until about 1850 and led to the ideology of science and to the banishment of philosophic influences on the work of the scientist. Intolerance of German philosophers toward empirical science and their contempt for the utilitarian were responsible for the absorption of the Germans in highly specialized research. Preoccupation with science and the discovery of new knowledge to the exclusion of human values helped to precipitate the catastrophe of German culture.

The fact that the general attitude in Germany was that universities were research centers and that teaching was incidental, robbed the German youth of a type of education which clarifies the individual purpose and criticism of social action and cultivates appreciation of human values. Professors and students were too busy accumulating knowledge to oppose Hitler. German teachers regarded themselves principally as scholars and research workers and accordingly treated their teaching perfunctorily. Good teaching and sensibility to human relationships are interdependent. Referring to the subordination of teaching to research in Germany, Dr. Lilge makes the following pertinent statements: "The research productivity, the results of which were visible enough, was what impressed the outside world and especially the United States colleges and universities began to rival it. The human void which yawned under that bustling productivity and the moral default which were its price escaped those naive admirers."

The author refrains from pointing out parallels, but this book may be a warning of what may happen in America if our colleges and universities fail to appreciate the place of the great teacher in developing people who are good as well as useful, and who have a full appreciation of the meaning of liberty and of the sanctity of humanity.

[2] Dean of Engineering, Purdue University, W. Lafayette, Ind. Fellow ASME.

Books Received in Library

AIRPLANE PERFORMANCE STABILITY AND CONTROL. By C. D. Perkins and R. E. Hage. John Wiley & Sons, Inc., New York, N. Y.; Chapman & Hall, London, England, 1949.

Cloth, 6 × 9¼ in., 493 pp., diagrams, charts, tables, $7. Written to meet the needs of the practicing aeronautical engineer, this book presents those elements of applied aerodynamics that bear directly on the problem of airplane design. The first part deals with problems of airplane design for performance in the subsonic, transonic, and supersonic ranges; and the second with problems involving the design of the airplane for adequate stability and control characteristics. Only subsonic flight is considered in the second section.

ASM REVIEW OF METAL LITERATURE, Volume 5, 1948. Edited by M. R. Hyslop. American Society of Metals, Cleveland, Ohio, 1949. Fabrikoid, 6 × 9¼ in., 822 pp., $15. This fifth volume represents a complete survey of the metallurgical literature published in installments in *Metals Review* from February, 1948, through January, 1949. As in previous volumes it contains short abstracts of articles and technical papers appearing in engineering, scientific, and industrial journals, broadly classified under twenty-six major headings. There is a separate section containing notes on some 250 pertinent books. Detailed author and subject indexes are provided.

AIRPLANE AND ITS ENGINE. By C. H. Chatfield, C. F. Taylor, and S. Ober. Fifth edition. McGraw-Hill Book Co., Inc., New York, N. Y., Toronto, Canada, London, England, 1949. Cloth, 6 × 9¼ in., 380 pp., illus., diagrams, charts, tables, $4.50. This textbook presents a comprehensive discussion of the fundamental principles, construction, and capabilities of the airplane and its engine. This edition also covers new developments in the field including gas turbines, jet engines, rocket engines, and reciprocating engines. The basic treatment is still nonmathematical, but simple algebraic relations are used where needed. All photographs and descriptions of the various types of airplanes are new.

ANALYSIS AND LUBRICATION OF BEARINGS. By M. C. Shaw and E. F. Macks. McGraw-Hill Book Co., Inc., New York, N. Y., Toronto, Canada, London, England, 1949. Cloth, 6 × 9¼ in., 618 pp., illus., diagrams, charts, tables, $10. Fundamental concepts are presented which underlie the design and performance of shaft bearings. General principles of bearing-load analysis are first developed, followed by the introduction of dimensional analysis. A series of chapters is devoted to the principles and problems of hydrodynamic lubrication, followed by discussions of rolling-contact bearings and of boundary lubrication. The final chapter briefly describes representative bearing-test machines.

APPLICATIONS DE LA MÉCANIQUE ALÉATOIRE A L'HYDRODYNAMIQUE ET A LA MÉCANIQUE QUANTIQUE (Publications Scientifigues et Techniques du Ministère de l'Air). By J. Bass. En Vente au Service de Documentation et d'Information Technique de l'Aéronautique, Magasin C.T.O.: 2 Rue de la Porte-d'Issy, Paris, France, 1949. Paper 7 × 10½ in., 143 pp., diagram, tables, 750 fr, $15. This work on the applications of statistical mechanics to hydrodynamics and quantum mechanics discusses fundamental hypotheses and the transfer theory, gives mathematical examples, and defines and demonstrates the use of the characteristic functions and variables. There is a bibliography.

APPLIED MECHANICS. By H. F. Girvin. Second edition. International Textbook Company, Scranton, Pa., 1949. Cloth, 6 × 9¼ in., 417 pp., diagrams, charts, tables, $5.25. Intended as a text for sophomore students, this book covers the material generally included in a course in applied mechanics. This second edition provides extended discussion of many topics and additional illustrative examples. In the sections dealing with kinematics, the notation is brought into line with current practice. About 300 new problems are added, bringing the total to over 1000 examples and problems.

CHRONOPHOTOGRAPHIE DES CHAMPS AÉRODYNAMIQUES. (Publications Scientifiques et Techniques du Ministère de l'Air, No. 226). By J. M. Bourot and C. Chartier. En Vente au Service de Documentation et d' Information Technique de l'Aeronautique, Magasin C.T.O.: 2 Rue de la Porte-d'Issy, Paris (15e), 1949. Paper, 7 × 10½ in., 210 pp., illus., diagrams, charts, tables, 900 fr. A detailed analysis of the study of aerodynamic flow by photographic means, utilizing periodic illumination of fine particles suspended in the flow. The book also discusses the production and characteristics of the particles, the optical problems in connection with the photographic work, and several special applications of the method.

COLD WORKING OF METALS. American Society for Metals, Cleveland, Ohio, 1949. Cloth, 6 × 9¼ in., 364 pp., illus., diagrams, charts, tables, $5. Seventeen papers presented at a seminar held during the 1948 National Metal Congress are published in this volume. Written by authorities in the field, these papers cover a variety of topics including stress and strain determination, crystallographic mechanisms, work hardening, and plastic deformation. Fundamental and scientific aspects are emphasized.

CONVECTION DE LA CHALEUR EN RÉGIME PERMANENT. By R. Legendre. Dunod, Paris, France, 1949. Paper, 5½ × 8¼ in., 118 pp., diagrams, charts, tables, 580 fr. Theoretical and empirical studies are reviewed relating to heat transfer by convection. Both laminar and turbulent flow are dealt with in relation to both tubes and flat plates. The treatment is highly mathematical.

DAVIDSON'S TEXTILE BLUE BOOK, United States and Canada, 84th Year, July, 1949. Davison Publishing Co., Ridgewood, New Jersey, 1949. Fabrikoid, 5 × 8 in., 1379 pp., illus., maps. Office edition, $8.25; Handy edition, $5.75. This standard directory contains condensed information concerning mills of the textile industry, covering cotton, woolen, rayon, silk, and jute goods, and those using the processes of knitting, dyeing, sanforization, etc. Related activities covered include listings of brokers, exporters, foreign firms, trade associations, testing laboratories, and railroads serving the trade.

DE LAVAL HANDBOOK, compiled by the engineering staff of the De Laval Steam Turbine Co. Edited by A. H. Church and H. Gartmann. De Laval Steam Turbine Company, Trenton, N. J., 1947. Cloth, 5½ × 8 in., paged in sections, illus., diagrams, charts, tables, $2. This handbook of reference data information, and formulas was compiled to facilitate the work of power plant, industrial, and design engineers. Following a general-information section are sections devoted to steam turbines, centrifugal pumps, IMO pumps, centrifugal compressors, helical reduction gears, and worm reduction of gears.

DEPRECIATION. By E. L. Grant and P. T. Norton, Jr. Ronald Press Co., Inc., New York, 1949. Cloth, 6¼ × 9½ in., 472 pp., charts, tables, $5. Following a statement of fundamental concepts, Part 2 deals with the treatment of depreciation for accounting and income-tax purposes. Part 3 describes business problems related to depreciation accounting with stress laid on the uses and limitations of depreciation account figures as a guide to decisions. A consideration of the public viewpoint and appendixes containing documentary and factual data complete the book. There is a bibliography.

DISEGNO DI MACCHINE. By M. Speluzzi and M. Tessarotto. Editore Ulrico Hoepli, Milano, 1949. Paper 8¾ × 10¾ in. paged in sections, diagrams, charts, tables, 4800 lire. This comprehensive and detailed work is intended both as a text and a practical reference book for machine designers, planners, and workshop technicians. It covers basic machine elements such as bearings, frames, gears, screws, power-transmission mechanisms, and engine parts, as well as turbines, pumps, marine and air propellers, and other mechanical units. It also includes chapters on materials, tolerances, gages, piping, and mechanical drafting. There are over 600 detailed figures and many data tables and charts.

DIESEL ENGINE CATALOG, volume 14, 1949. R. W. Wadman, Publisher, Diesel Engines, Inc., New York, N. Y. Fabrikoid, 10¾ × 13¾ in., 378 pp., illus., diagrams, charts, tables, $10. This book supplies the reader with a cross section of the Diesel industry, giving detailed descriptions of the engines available and of the designs developed during the past year. In addition to Diesel engine manufacturers, the advertising section also covers equipment and transmission manufacturers. An extensive classified index is provided.

ELEMENTS OF PATENT LAW. By F. H. Rhodes. Cornell University Press, Ithaca, N. Y., 1949. Cloth, 5¾ × 8¾ in., 189 pp., $2.75. In simple, nonlegal language, this book supplies the answers to many points about patents for inventions with which the inventor should be informed. Design patents are not considered. In addition to a discussion of the whys and wherefores of patent law, citations from a selected list of court decisions, with summaries of the significant circumstances of the individual cases, are included.

ENGINEERING MATERIALS AND PROCESSES—Metals and Plastics. By W. H. Clapp and D. S. Clark. Second edition. International Textbook Co., Scranton, Pa., 1949. Linen, 6 × 9¼ in., 526 pp., illus., diagrams, charts, tables, $6.50. The physical properties and uses of the principal metals and plastics are discussed, including a description of the methods by which these materials are processed. In this second edition the greatest changes are in the chapters on cooling curves and equilibrium diagrams, plastics, castings, and joining of metals. New basic processes are included in most of the chapters.

FLUID PRESSURE MECHANISMS. By H. G. Conway. Pitman Publishing Corporation, New York, N. Y., and London, England, 1949. Cloth, 5½ × 8¾ in., 218 pp., diagrams, $5. (25s.) Covering a wide variety of devices, this book deals with the mechanism of fluid-pressure equipment and systems. It is not concerned with detail design and construction, but with the essential principles of various devices, how they work, and how they differ from each other. Hydraulic, pneumatic, and compressed-gas systems of high, medium, and low pressure are considered. Recent advances in the design and application of fluid-pressure mechanisms are included.

FUNDAMENTALS OF POWER PLANT ENGINEERING. By G. E. Remp. National Press, Millbrae, Calif., 1949. Cloth, $5^1/_2 \times 8^3/_4$ in., 347 pp., illus., diagrams, charts, tables, \$6.50. This book is designed both as a text for a course in power engineering and as a reference work for engineers. Although the principal portion is devoted to steam-power plants, there are also chapters on Diesel-electric, hydroelectric, and gas-turbine power plants. Special emphasis is placed on power-plant economics, the estimation of equipment performance, and heat-transfer calculations.

DER LADUNGSWECHSEL DER VERBRENNUNGSKRAFTMASCHINE. (Die Verbrennungskraftmaschine, Band 4, Teil 1). By H. List and G. Reyl. Springer-Verlag, Vienna, Austria, 1949. Paper, $7^1/_4 \times 10^1/_2$ in., 239 pp., diagrams, charts, tables, 62.60 Sw. Fr., \$14.40. This first part of the fourth volume of a sixteen-volume set on internal-combustion engines is devoted to fundamental mathematical treatment of the fluctuating flow processes in the engine. The first section contains fundamentals and definitions; the second, step-by-step procedures, using a minimum of higher mathematics, for calculating the flow in the engine; in the third, fluctuating flow in the gas column is studied by the use of flow in open-surface channels as an analogy.

MECHANICAL ENGINEERING PRACTICE, a Laboratory Reference Text. By C. F. Shoop and G. L. Tuve. Fourth edition. McGraw-Hill Book Co., Inc., New York, N. Y., Toronto, Canada, London, England, 1949. Cloth $6^1/_4 \times 9^1/_4$ in., 513 pp., illus., diagrams, charts, tables, \$4.50. Intended as a combined textbook and reference handbook, this volume is a laboratory manual of experimental engineering. In this fourth edition, increased emphasis is placed upon scientific fundamentals. While many simple introductory experiments are retained, many more projects that demand a more mature scientific and technical preparation are included. New chapters, tables, charts, and data are added on the new types of equipment developed since the last edition.

National Research Council, HIGHWAY RESEARCH BOARD. Proceedings, 28th Annual Meeting. Edited by R. W. Crum, F. Burggraf, and W. N. Carey, Jr. National Research Council, Washington, D. C., 1949. Cloth, $6^1/_2 \times 9^3/_4$ in., 538 pp., illus., diagrams, charts, tables, \$7.50. This volume contains the papers and reports presented at the 1948 annual meeting of the Board which were not published elsewhere. The papers are grouped under six broad classifications as follows: economics, finance, and administration; design; materials and construction; maintenance; traffic and operations; and soils. Committee reports on a variety of subjects are published including the report of the new Committee on Night Visibility.

OIL TITAN OF THE SOUTHWEST. By C. C. Rister. University of Oklahoma Press, Norman, Okla., 1949. Cloth, $6^1/_4 \times 9^1/_4$ in., 467 pp., illus., charts, maps, tables, \$5. An account of the rush for oil riches in the Mid-continent and Gulf producing area, from the era of the Indians' oil springs through the wildcatters' heyday to the recent period of exploration and development. It tells the story of the men and corporations associated with the industry and describes the adoption of scientific methods and controls.

PETROLEUM REFINERY ENGINEERING. By W. L. Nelson. Third edition. McGraw-Hill Book Co., Inc., New York, N. Y., Toronto, Canada, London, England, 1949. 830 pp., illus., diagrams, charts, tables, \$9. Of value to engineering students, plant superintendents, engineers and chemists, this book presents the fundamentals of petroleum-refinery engineering, design, and processing. In this third edition, the main changes include new and revised physical data; practical detail on plant operation; and new processes, products and operations. Some of the basic chemical engineering material was deleted. New figures, tables, and examples are included. The several hundred references in the chapter bibliographies are all new and together with those of the earlier editions constitute a considerable body of supplementary information.

PRACTICAL PETROLEUM ENGINEERS' HANDBOOK. By J. Zaba and W. T. Doherty. Third edition, revised and enlarged. Gulf Publishing Company, Houston, Texas, 1949. Leather, $5^1/_2 \times 8^1/_2$ in., 654 pp., diagrams, charts, tables, \$10. The third edition of this standard reference work contains 162 additional pages of tables, charts, and data. The main revisions are in the sections on tubular-goods specifications and petroleum-engineering methods owing to the many changes and improvements since the last edition.

RUBBER RED BOOK, Directory of the Rubber Industry. Seventh edition, 1949. *Rubber Age*, 250 West 57th St., New York, N. Y., 1949. Cloth, $6 \times 9^1/_4$ in., 923 pp., illus., diagrams, tables, \$5. As in previous editions, this publication provides an alphabetical and classified directory of manufacturers of rubber products, natural rubber, and synthetic rubbers. There is a buyers' guide to equipment, chemicals, and fabrics. Reclaimed rubber, scrap rubber, and rubber latex are also covered. Lists of consulting technologists, trade organizations, and technical journals, and a new section on educational courses in rubber technology are included.

STANDARD METAL DIRECTORY. Eleventh edition, 1948–49. Atlas Publishing Co., New York, N. Y., Cloth, $6 \times 9^1/_4$ in., 998 pp., \$15. Containing reports on over 10,000 steel mills, foundries, smelters, rolling mills, and nonferrous-metal plants, this directory contains such pertinent data as the names of the president, sales manager, and purchasing agents, equipment, products, and raw material used. Completely revised and brought up to date, this edition has a new section called "Metal Products Index" which lists geographically distributors of steel and metal products, arranged according to commodities.

STEAM POWER PLANTS. By P. J. Potter. Ronald Press Company, New York, N. Y., 1949. Cloth, $6^1/_4 \times 9^1/_2$ in., 503 pp., illus., diagrams, charts, tables, \$6.50. Intended for use by both engineering students and engineers in industry, this book presents the fundamental principles of design of steam power plants. Flow of fluids, pumps, heat transfer, fuels and combustion, steam generators, engines, and turbines are all treated in detail. There is no discussion of the various kinds of equipment that are available nor of empirically designed apparatus. Included are many problems and examples taken from practical situations.

SUPERVISOR'S MANAGEMENT GUIDE. Edited by M. J. Dooher and V. Marquis. American Management Association, New York, N. Y., 1949. Fabrikoid looseleaf binder, $6^1/_4 \times 9^1/_4$ in., 190 pp., \$3.50, (AMA members, \$3). Based on the human-relations material published by the American Management Association during the past few years, this guide assists supervisors, foremen, and other operating executives in industry in applying new developments in management methods for improving human relations in business.

Library Services

ENGINEERING Societies Library books may be borrowed by mail by ASME Members for a small handling charge. The Library also prepares bibliographies, maintains search and photostat services, and can provide microfilm copies of any item in its collection. Address inquires to Ralph H. Phelps, Director, Engineering Societies Library, 29 West 39th St., New York 18, N. Y.

TECHNICAL ASSISTANCE FOR ECONOMIC DEVELOPMENT. United Nations, Lake Success, New York, N. Y., May, 1949. Paper, 6×9 in., 328 pp., tables, \$2.50. This report considers a comprehensive plan for an expanded co-operative program of technical assistance for economic development through the United Nations. Part 1 sets out the objectives and nature of the program, the field of work covered, and the proposed organizational and financial arrangements. Part 2 contains the proposals and statements of the various organizations involved.

TOOL ENGINEERS HANDBOOK. Edited by F. W. Wilson. McGraw-Hill Book Co., Inc., New York, N. Y., Toronto, Canada, London, England, 1949. Cloth, $6 \times 9^1/_4$ in., 2070 pp., diagrams, charts, tables, \$15. Of interest to all associated with the mechanical manufacturing industries, this reference book covers all phases of planning, control, design, tooling, and other operations involved in the processing of finished products. It is based, wherever possible, on published governmental, associational, and industrial-company standards, and contains many definitions, symbols, equations, tables, and charts, in addition to methods, practices, and procedures. The more than 2000 pages of basic factual data are divided into separate chapters for the major types of tools and processes.

TECHNISCHE HYDRAULIK. By C. Jaeger. Verlag Birkhaüser, Basel, Switzerland, 1949. Cloth and linen bound, $6^1/_2 \times 9^1/_2$ in., 464 pp., illus., diagrams, charts, tables, 48.50 Sw. fr., linen bound; 44.50 Sw. fr., unbound. Based on the author's experience in the field, this book describes the calculation methods used in the planning of hydraulic power plants. Following an introductory chapter reviewing the physical principles of hydraulics, the author presents the basic theories and equations for steady flow and shows their development and application to certain conditions. Surge chambers and the problem of water hammer are treated at considerable length. The last chapter deals with the various aspects of ground-water flow.

TECHNISCHE STRÖMUNGSLEHRE. By B. Eck. Third edition, revised and enlarged, Springer-Verlag, Berlin, Göttingen, Heidelberg, Germany, 1949. Paper and bound in linen, 6×9 in., 398 pp., illus., diagrams, charts, tables, 24 DM (27 DM, bound in linen). This treatise on hydrodynamics covers the basic principles of various types of flow at considerable length, with particular attention to the influence of friction. These principles are then utilized in the analysis of blade and propeller action, airfoils, cavitation, etc. The motion of solid bodies in a flowing medium is considered, such as in dust collectors and pneumatic conveyers. There is a final chapter on flow-measuring methods and apparatus.

THE ENGINEERING PROFESSION

News and Notes

As Compiled and Edited by A. F. Bochenek

1949 Year of Notable Achievement for Engineers Joint Council

During 1949 Engineers Joint Council: (1) Adopted a formal constitution providing for admission of new member societies; (2) released a report on employment opportunities for engineering graduates in 1949; (3) conducted a survey on research and development personnel for the National Military Establishment; (4) contributed to the work of the Hoover Commission; (5) worked with the Economic Cooperation Administration in suggesting qualified engineers for important administrative posts; (6) and (7) represented American engineers at international conferences in South America and Western Europe; (8) sponsored a unification conference to which 16 national engineering societies were invited, and (9) within the last several weeks applied for consultative status with the Economic and Social Council of the United Nations.

EJC Constitution

The EJC constitution (see page 96 of January, 1949, issue of Mechanical Engineering) is the logical development in a series of actions taken by the Founder Societies to fill the vacuum created by the disbandment of the American Engineering Council in 1936. In the years following 1936, the men who guided the destiny of the AEC sought without financial support to create a new co-ordinating agency which could inherit the good will and the unfinished work of the AEC. Their first approach was through an informal committee of secretaries of the Founder Societies and The American Institute of Chemical Engineers, aided by the officers of these organizations. In 1941 this group operated as the Engineers Defense Board and successfully carried through the important work of developing substitute materials and methods of economizing and salvaging scarce war materials for the Government. In 1945 this group constituted itself informally as the Engineers Joint Council and appointed committees which submitted reports on the Industrial Disarmament of Aggressor States which were accepted with approval by the controlling authorities in both Germany and Japan. Since 1945 EJC expanded its activities to the point where a formal constitution was necessary, if the mounting number of projects calling for EJC attention were to be prosecuted effectively.

What the new constitution did was to strengthen the structure of EJC, streamline its procedures, and provide for admission of other national engineering societies on the professional level. Its significance to the individual member of the constituent societies lies in the fact that it provides a top-level co-ordinating body which can direct the energies of a large portion of the engineering profession into channels of public service where its talents can be utilized.

EJC Survey Report

The report of the General Survey Committee of EJC provided reliable data on the relative demand of engineers in 1948 and 1949 in addition to facts about salary trends. (See pages 665–668 of the August issue of Mechanical Engineering.) The usefulness of this report was reflected in the large demand for copies by industrial leaders and educators. Another such report will be released in 1950. Economic facts about what is happening to engineers is a valuable tool which every engineer can use in judging his own progress and for planning his career.

Research and Development Personnel

In accepting the job of providing the National Military Establishment with a list of research and development personnel, the EJC demonstrated that the engineering profession is in fact a responsible entity prepared to carry through national projects which fall within its sphere of activities. (See page 617, July 1949, issue of Mechanical Engineering.) Since actions are more important than expressions of good intentions, EJC performance in this case will be noted by Government agencies and other professional groups.

Tacit recognition of EJC as a responsible co-ordinating body of the engineering profession is evident in the reception given by the Hoover Commission and the Economic Cooperation Administration to offers of aid by Engineers Joint Council. EJC committees contributed to both of these important national projects by serving with subcommittees and by suggesting names of qualified engineers who have been appointed to responsible ECA positions.

International Conferences

EJC co-operation with the engineers of Western Europe and the Latin-American countries through the Conferences held in 1949 in London (see page 955, November, 1949, issue) and Rio de Janeiro (see page 776, September, 1949, issue) may have long-term significance for members of EJC societies. The exchange of mutual privileges may be the key to employment opportunities overseas which yet may prove a factor in the success of President Truman's "Point Four" program.

The part played by EJC in calling into conference, (see page 1062, December, 1949, issue) representatives of 16 American national engineering societies may be the harbinger of a period of greater co-ordinated effort by engineers in the public interest. The benefits from such co-ordinating action in such fields as engineering education, professional development, and economic status can hardly be foretold.

ENGINEERS JOINT COUNCIL HONORS DR. GOUGH AT THE ASME ANNUAL MEETING

(*Left to right:* James D. Cunningham, president, ASME; H. J. Gough, president, The Institution of Mechanical Engineers; Richard E. Dougherty, president, EJC; and James M. Todd, retiring president, ASME.)

In recent weeks EJC took another positive step in the field of international relations by applying for consultative status with the Economic and Social Council of the United Nations.

Dr. H. J. Gough Honored by EJC

DR. H. J. GOUGH, president of The Institution of Mechanical Engineers, Great Britain, was guest of honor at an informal luncheon held at the Statler Hotel, New York, N. Y., on Friday, December 2. Richard E. Dougherty, president of the Engineers Joint Council, presided, and Dr. Gough was introduced by James M. Todd, president, The American Society of Mechanical Engineers.

Dr. Gough spoke in an informal manner of the relationships which had been established between engineers in Great Britain and the United States as a result of the London Conferences of representatives of the engineering societies of those two countries and other countries of Western Europe. He paraphrased some of the expressions of good will and co-operation that he had used in his address delivered at the 1949 ASME Annual Dinner held on November 30.

Present at the luncheon, in addition to Mr. Dougherty, Mr. Todd, and Dr. Gough, were: E. G. Bailey, past-president ASME; Waldo Bowman, editor, *Engineering News-Record*; George W. Burpee, of Coverdale and Colpitts, New York; W. N. Carey, secretary ASCE; James D. Cunningham, president-elect ASME; C. E. Davies, secretary ASME; R. M. Gates, past-president ASME; James L. Head, Anaconda Copper Company, New York; H. H. Henline, secretary AIEE; M. D. Hooven, director AIEE; Col. H. C. Moulton, past-president AIME; Dr. A. B. Newman, past-president AIChE; E. W. O'Brien, past-president ASME; Malcolm Pirnie, past-president ASCE; E. A. Pratt, member EJC Committee on International Relations; Brig. Gen. Stewart E. Reimel (retired), secretary, EJC Committee on International Relations; Dr. Harry S. Rogers, chairman ECPD; Dr. Thorndike Saville, president ASEE; Thomas E. Purcell, vice-president ASME; Ralph A. Sherman, vice-president ASME; and Ernest Hartford, S. A. Tucker, and George A. Stetson, of the ASME staff.

EJC Survey Closes March 15

THE selected engineering personnel survey currently being sponsored by the Engineers Joint Council for the U. S. Office of Naval Research will close March 15, 1950. Of the more than 100,000 questionnaires sent to professional members of 18 national engineering societies, 60 per cent have been returned. The data provided will be used in the compilation of a list of personnel for use by the National Military Establishment in the solution of a variety of technical personnel problems.

Members who have not yet given attention to the questionnaires, are urged to do so before March 15, so that they can be included among engineering resources of the nation.

The survey was initiated as the result of a conference held in Washington, D. C., late in 1948, attended by EJC representatives and those of many other engineering agencies, at which the need was discussed for a list of key engineers working in research, development, and other scientific projects, who could be called in on a full or part-time basis to work on the broad scientific programs of the National Military Establishment.

Members who received the questionnaire were selected from the upper echelon of the profession. There is still time to answer all the questions and to return the form before the March deadline.

Model Engineer-in-Training Program Proposed

TO PROMOTE uniformity with respect to engineering registration, particularly to certification of engineering graduates as engineers in training, the Committee on Engineers in Training of the National Council of State Boards of Engineering Examiners recently proposed a model program which, if adopted by the individual State Boards, would eliminate much of the confusion and difficulties currently hamstringing more than 11,000 young engineers in 19 states who are registered as engineers in training.

The engineer-in-training program inaugurated several years ago encourages the young graduate engineer to take a part of the registration examination at the time or soon after graduation when the subject matter is fresh in his mind. Successful passage entitles him to a certificate as engineer in training. Several years laters when he has accumulated the required experience, he need take only the final part of the examination to qualify for an engineering license.

Difficulty with the program has stemmed from the fact that young men frequently change jobs in the period following graduation and find themselves in states other than the one in which they registered as engineers in training. These men usually find that their certificates are not honored because of the different requirements among the states.

The model program recently discussed at the 28th annual meeting of the NCSBEE held at Daytona Beach, Fla., Nov. 10–12, 1949 (for report of this meeting see page 94), recommends that qualifications for a certificate as engineer in training be based on an eight-hour written examination, 30 to 70 per cent of which is devoted to basic subject matter and the remainder to the specialized curriculum of the applicant. It was also recommended that the examination be given on the campus, three to six weeks before graduation; also that the examinations be proctored and graded by registered engineers on the faculty. It was suggested that a fee of $5.00 would not be burdensome to the average candidate and would be adequate to cover cost of administration.

More on Engineering Salaries

Metallurgists Highest Paid

ENGINEERING graduates are finding starting salaries about the same as last year, according to a recent survey made by New York University College of Engineering, New York, N. Y.

Questionnaires were mailed by the college to 379 members of the 1949 graduating class during September. Returns totaled 167, or about 44 per cent. Information supplied by the poll included data on type of job, how it was obtained, salary, and whether or not it was satisfactory.

NYU Average Starting Salaries

The average starting salary, it was reported, is $253 a month, as compared with $252 for 1948, and $227 for 1947. The figures compiled showed little change in starting salaries during the past twelve months.

A summary of the starting salaries reported in six major engineering fields follows:

	1947	1948	1949	% change
Chemical	$235	$264	$294	+11.4
Mechanical	228	256	256	+00.0
Aeronautical	211	245	254	+ 3.6
Electrical	237	251	248	− 1.2
Civil	235	255	245	− 3.9
Administrative	198	230	238	+ 3.5
Average	227	252	253	+ 0.4

Of the graduates who returned the questionnaires, the majority took jobs in private industry, a small group went into civil-service posts, and others enrolled for graduate courses.

In answer to the question "How Did You Obtain Your Job?" 39 per cent of the responding students said it was through direct personal inquiry; 33 per cent through family or friends; 14 per cent through the University's placement bureau; six per cent through the engineering faculty; and eight per cent through newspaper, agency, or engineering societies.

ASM National Survey

Another survey conducted by the American Society for Metals provided data which showed that metallurgists are the highest paid of all the engineering groups.

The average income for metallurgists, according to the ASM analysis, is $6567. The national average income for all types of engineering, according to the U. S. Bureau of Labor Statistics, is $4668. Comparisons with other professional incomes are equally impressive. The lawyer receives an average of $5719; the chemical engineer's annual average is $4320. The average yearly income of all college graduates in the U. S. is $4689, while the average yearly pay of all U. S. workers is $2840.

Three factors were shown to affect a metallurgist's income—his responsibility, his col-

lege or technical training, and the length of time on the job.

Aside from 6.5 per cent of those queried who had succeeded to administrative and sales positions, the responsibility of metallurgical control over quality and production offered the highest income—a high of $35,000, with an average of $7221.

The second factor—that of technical training—shows that with a bachelor's degree, the metallurgists' income averaged $6601. A master's degree justified $6877. The metallurgist with a doctor's degree has an average yearly income of $9122.

The third influence came from experience or length of service. Metallurgists with one year out of college drew an average income of $3700. After five years on the job, the average went to $5500. Ten years' experience advanced the income to an average of around $6500. Twenty years after graduation, the metallurgist was averaging $8100. The peak average income, $9000, is reached 30 years after receiving a college degree. From this point the average income gradually decreases, the report stated.

Engineering Societies Monographs Committee

ONE of the valuable services made possible by engineers who pay dues to the Founder Societies (ASCE, AIME, ASME, and AIEE) is that provided by the Engineering Societies Monographs Committee. Under a contract between the United Engineering Trustees, Inc. and the McGraw-Hill Book Company, this committee has been making available to engineers books on highly specialized subjects which normally would have to go begging for a publisher. Since 1931 the Committee has arranged for the publication of nine volumes recognized the world over as some of the most authoritative texts in their fields. So highly regarded is the series among engineers and scientists, that authors now seek to have their work published under the Committee's imprint in preference to that of other publishers. Under the agreement the Engineering Societies Library has received $6500 in royalties.

Some of the books in the series are: "Plasticity: A Mechanics of the Plastic State of Matter," by Arpad Nadai (1931); "Hydraulics of Open Channels" by Boris A. Bakhmeteff (1932); "Theory of Elasticity" by Stephen Timoshenko (1934); and "Fluid Mechanics for Hydraulics" by Hunter Rouse (1938).

The Committee currently has six manuscripts under consideration, one of which has already been examined, approved, and scheduled for publication in 1950.

The Committee is composed of two representatives of each of the following Societies: American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, and the American Institute of Electrical Engineers. The director of the Engineering Societies Library, New York, N. Y., acts as chairman and secretary. The Committee's aims as stated in its contract are:

(1) to create and assemble under a series title monographs of high technical quality on all phases of engineering, which will raise the standard of American engineering literature.

(2) to rescue from obscurity important technical manuscripts which, owing to the absence of a suitable endowment, would not otherwise be published.

(3) to outline and develop manuscripts by competent authors to fill gaps in existing literature.

(4) to collect into one volume information of especial timeliness on a given subject, scattered through the journals of two or more societies.

(5) to build up for Engineering Societies Monographs a reputation equivalent to that now had by other well-established series.

ASME representatives on the Committee are: T. R. Olive and G. R. Rich.

Specialization Holds Back Engineers in Industry

THE tendency among engineers to specialize was the most important factor responsible for the failure of many engineers to get into top management, according to Bruce Wallace, vice-president and treasurer, Otis Elevator Company, New York, N. Y. Mr. Wallace spoke before the 15th Annual Convention of the Society for Advancement of Management.

While acknowledging the tremendous contribution of engineers to productive efficiency, Mr. Wallace pointed out that most engineering effort was concentrated in only 10 to 15 per cent of the sales dollar. "The industrial engineer," he warned, "must broaden his scope and realize that great possibilities exist for him in the control of 85 to 90 per cent of the sales dollar."

"The engineer cannot just drop his present work and begin to move into the other departments' affairs," Mr. Wallace said, "but he can start a campaign of self-education, break away from this concentration on a specialized field, and begin to learn about the over-all operation of general business and to his company's business in particular. His training is a sound foundation for success in either the manufacturing or financial end of a business. It is a foundation only, and the structure must be supplied by the diligence and application of the individual and by his willingness to study and prepare himself for wider responsibilities.

"He will find that the plant manager spends very little of his time on improvements in operations. He devotes his time to ironing out personnel problems, determining the correct rate of production, putting pressure on here and there to get orders out on time, finding out why his inventory has gone up or trying to find out why his expense did not drop when the volume did, or why the cost of some new product was higher than estimated. The industrial engineer must prepare himself on subjects like that if he is to rise to the top in the manufacturing field.

"It is in the financial field that I feel there is an unrecognized opportunity for the industrial engineer. By financial, I mean all the allied activities that affect or control the company's financial position. This includes the operation of the wage-incentive system, the cost system, budget system and even the corporate counting which is actually the recording of what has been done in the other activities."

Mr. Wallace offered the following recommendation to engineers: "Determine to expand your usefulness; learn something of general business problems; study the principles and practice of sound costing; study budgeting and the control of expense; make yourself authorities on all phases of your business which stem from your original wage-incentive standards. You will find your usefulness to your company expanded and that suitable recognition will follow."

NCSBEE Holds 28th Annual Meeting

C. L. Eckel Elected President for 1949–1950

THE Twenty-eighth annual meeting of the National Council of State Boards of Engineering Examiners held at Daytona Beach, Fla., Nov. 10–12, 1949, was attended by official delegates from 35 states and representatives appointed by ten national engineering societies.

The following officers were elected for the ensuing year: president, Clarence L. Eckel, dean of engineering, University of Colorado, Boulder, Colo.; vice-president, Russell G. Warner, vice-president of The United Illuminating Company, New Haven, Conn.; director of the Central Zone, Thomas C. Shedd, professor of structural engineering, University of Illinois, Urbana, Ill.; director of the Northeast Zone, Ned Spaulding, consulting engineer, Hudson, N. H. The following officers will continue for another year: past-president, Alexander Blair, Lake Placid, Fla.; director of the Western Zone, Paul E. Jeffers, Los Angeles, Calif.; director of the Southern Zone, Dean N. W. Dougherty, Knoxville, Tenn. T. Keith Legaré, of Columbia, S. C., begins his twenty-seventh term as executive secretary.

Committee Reports

The Committee on Registration by Endorsement through its chairman, Dr. D. B. Steinman, presented a forceful report[1] calling attention to some of the weaknesses and defects in registration procedure with suggestions for their correction. The Committee on Engineers in Training outlined the objectives of the engineer-in-training program with certain recommendations. The Committee on Uniform Laws and Procedures emphasized the importance of enforcement of registration laws and reported an increasing interest in this subject. Four amendments presented by the Committee on Constitution and By-Laws were adopted. The amendment to the Constitution proposed by the Missouri Board and referred to in their letter sent to all members of the

[1] The full text of Dr. Steinman's report will be published in an early issue of MECHANICAL ENGINEERING.

National Council on Oct. 17, 1949, was withdrawn by the Committee on Constitution and By-Laws at the request of the chairman of the Missouri Board who was a member of the Committee.

Alexander Blair, president NCSBEE, presented with his report several interesting charts showing a graphical analysis of sources of income and other data for the National Council, and a chart showing the schedule of membership fees adopted by the National Council in 1946. He also called attention to the increase in the number of registered engineers and the fact that the finances of the Council are gradually becoming established on a sounder basis.

More than 150,000 Engineers Registered

The executive secretary's report indicated that there are now more than 150,000 registered professional engineers in the United States and its territories, also that 11,524 engineers in training have been certified by 19 states. Attention was called to the fact that sixteen states have amended their laws during the past two years, these amendments being principally for the purpose of raising the standards and making the laws more in accord with the Model Law.

The delegates from the four Zones of the National Council held separate group meetings on the first day when subjects of special interest to these groups were discussed. All standing committees held meetings during the afternoon of the first day and the Board of Directors held two meetings.

The annual banquet was an outstanding feature and was well attended. Herbert D. Mendenhall, president of the Florida Board, was toastmaster. Distinguished Service Certificates were presented by Mr. Blair, to Dr. Steinman, and Dean Erich Hausmann, members of the New York Board. J. Williamson, Jr., president of the Florida Society of Professional Engineers, presented Alexander Blair a medal for outstanding service to the profession.

A masterful address on "Registration—A Dream Come True" was made by Dr. Steinman, past-president of NCSBEE. An enjoyable feature of the banquet and of the fellowship party was the songs rendered by The Bethune Cookman College Choir.

The honor guests at the banquet were the officially appointed representatives of the national engineering societies, who were as follows: J. M. Muir, secretary, The Dominion Council of Professional Engineers; Edmund Friedman, director, American Society of Civil Engineers; A. F. Greaves-Walker, American Institute of Mining and Metallurgical Engineers and The Institute of Ceramic Engineers, C. E. Davies, secretary, The American Society of Mechanical Engineers; H. H. Henline, secretary, American Institute of Electrical Engineers; Robert L. Sumwalt, American Society for Engineering Education; A. G. Stanford, president, National Society of Professional Engineers; W. Austin Smith, American Association of Engineers; R. L. Groover, director, American Railway Engineering Association; George B. Nutt, American Society of Agricultural Engineers; and Paul H. Robbins, executive director, National Society of Professional Engineers.

The 1950 Annual Meeting of the National Council will be held at Chicago, Ill., and the 1951 Annual Meeting will be held at Boston, Mass.

How to Obtain an Engineering License

Addresses of State Secretaries

WHILE the requirements for an engineering license differ in detail from state to state, the procedure for obtaining one by an engineer of average experience is generally about the same no matter in what state he resides.

In general, the procedure is as follows: The applicant writes to the secretary of his State Board of Engineering Examiners for a copy of the state registration act and a copy of an application form for an admission to the examination. The law will spell out the specific age and experience requirements. The addresses of the person in each state and territory from whom the law and the application forms can be obtained are listed elsewhere on this page.

A reading of the law will help the applicant to decide whether he can meet age and experience requirements. Usually literature provided by the secretary will carry a discussion of the kind of experience that is acceptable to the Board. The applicant's next step is to fill out the form, provide the number of references asked for, and return the form to the Board along with the application fee. Within four to six weeks the Board will check the references and notify the applicant of his admission to the examination. Since the examinations are usually given at periodical intervals, several months may elapse between notification of admission to the examination and the date of the examination.

Review Courses

This time can be used to advantage in preparation for the examination. In many industrial centers, engineering societies, engineering schools, and some of the larger companies sponsor review courses. Although no national list of organizations giving such courses is available, information about them can usually be obtained from local sections of national engineering societies, engineering schools, or the State Society of Professional Engineers.

In communities where no review courses are available an applicant may be able to obtain copies of past examinations for study from the State Board. Particularly useful are the copies of the past examinations given by the State of New York. These examinations have been conveniently packaged by the Metropolitan Section of The American Society of Mechanical Engineers and may be obtained by writing to the ASME Metropolitan Section, 29 West 39th Street, New York 18, N. Y. The package sells for 50 cents and contains all the examinations held in the years 1943 through 1948.

Young graduate engineers who cannot meet the experience requirements should check carefully whether the laws of his state provide for the engineer-in-training classification. Some 19 states have amended their laws to permit young engineers to take portions of the examinations upon graduation to qualify for a certificate of engineer in training. Holders of these certificates which are honored in most states on a reciprocal basis, need take only the final portion of the examination when they have acquired the requisite experience to obtain a professional license.

Addresses of State Secretaries

Addresses of secretaries of State Boards of Engineering Examiners follow:

Alabama: Clifton C. Cobb, Executive Secretary, 702 Washington Avenue, Montgomery 5, Ala.

Alaska: Linn A. Forrest, Secretary, Box 251, Juneau, Alaska

Arizona: Lewis S. Neeb, Secretary, 204 East 6th St., Tempe, Ariz.

Arkansas: V. E. Scott, Secretary-Treasurer, Box 175, Pulaski Height Station, Little Rock, Ark.

California: Pecos H. Calahan, Executive Secretary, 529 Business and Professions Building, 1020 N Street, Sacramento 15, Calif.

Colorado: M. C. Hinderlider, Secretary-Treasurer, 20 Capitol Building, Denver, Colo.

Connecticut: William K. Simpson, Secretary, 30 Oak Street, Hartford 6, Conn.

Delaware: T. J. McDonnell, Secretary, 1207 Clayton Street, Wilmington, Del.

Florida: Mrs. Ann P. Clover, Executive Secretary, 702 John F. Seagle Building, Gainesville, Fla.

Georgia: R. C. Coleman, Joint Secretary, 111 State Capitol, Atlanta, Ga.

Hawaii: A. W. Heen, Secretary, 1129-1 S. King Street, Honolulu 14, T. H.

Idaho: Raymond J. Briggs, Secretary, Briggs Engineer Bldg., 619 Grove Street, Boise, Idaho.

Illinois: Titus G. LeClair, Secretary, c/o Commonwealth Edison Co., 72 W. Adams St., Chicago, Ill.

Indiana: L. T. Gootee, Executive Secretary, State Capitol, Indianapolis, Ind.

Iowa: Henry Wichman, Secretary, State Capitol Building, Des Moines 19, Iowa.

Kansas: G. W. Bradshaw, Secretary, c/o University of Kansas, Lawrence, Kan.

Kentucky: C. S. Crouse, Secretary-Treasurer, c/o University of Kentucky, Lexington 29, Ky.

Louisiana: Leo M. Odom, Secretary, P. O. Box 267, Baton Rouge, La.

Maine: Bryant L. Hopkins, Secretary, Bangs Station, Waterville, Me.

Maryland: J. W. Gore, Secretary, 1101 Key Highway, Baltimore 30, Md.

Massachusetts: Albert Haertlein, Secretary, Room 413C, State House, Boston, Mass.

Michigan: Henry G. Groehn, Executive Secretary, 705 Cadillac Square Building, Detroit 6, Mich.

Minnesota: Helen D. Carlson, Executive

Secretary, 316 New York Building, St. Paul, Minn.

Mississippi: O. B. Curtis, Sr., Secretary, P. O. Box 3, Jackson, Miss.

Missouri: Mrs. Clemmie V. Wall, Secretary, Box 184, Jefferson City, Mo.

Montana: E. R. Dodge, Secretary, c/o Dept. Civil Engineering, Montana State College, Bozeman, Mont.

Nebraska: Roy M. Green, Secretary, 204 M. A. Building, University of Nebraska, Lincoln 8, Neb.

Nevada: Stanley G. Palmer, Secretary, c/o College of Engineering, University of Nevada, Reno, Nev.

New Hampshire: Ned Spaulding, Secretary, 6 School Street, Hudson, N. H.

New Jersey: Thomas E. Heathcote, Secretary and President, 921 Bergen Avenue (Room 710), Jersey City 6, N. J.

New Mexico: John H. Bliss, Secretary, P. O. Box 1079, Santa Fe, N. M.

New York: Newell L. Freeman, Secretary, c/o New York State Education Dept., 23 South Pearl St., Albany, N. Y.

North Carolina: C. L. Mann, Secretary, Room 207, Civil Engineering Bldg., N. C. State College, Raleigh, N. C.

North Dakota: Frank E. Cave, Secretary, State Capitol, Bismarck, N. D.

Ohio: Robert N. Waid, Secretary, 21 West Broad Street, Columbus, Ohio.

Oklahoma: Gwynne B. Hill, Secretary, 516 Petroleum Building, Oklahoma City, Okla.

Oregon: E. A. Buckhorn, Secretary, 433 Builders Exchange Building, Portland, Ore.

Pennsylvania: Miss Rebecca J. Nickles, Secretary, 324 Education Building, Harrisburg, Pa.

Puerto Rico: Luis Cueto Coll, Secretary-Treasurer, P.O. Box 3717, Santurce, P. R.

Rhode Island: Philip S. Mancini, Secretary, 242 State Office Bldg., Providence, R. I.

South Carolina: T. Keith Legaré, Secretary, P. O. Drawer 1404, Columbia, S. C.

South Dakota: Earl D. Dake, Secretary, c/o South Dakota School of Mines and Technology, Rapid City, S. D.

Tennessee: Donald W. Southgate, Secretary-Treasurer, 1313 Nashville Trust Building, Nashville, Tenn.

Texas: Carl L. Svensen, Secretary, 912 Tribune Building, Austin, Texas

Utah: Frank E. Lees, Secretary, 324 State Capitol Building, Salt Lake City, Utah

Vermont: Walter D. Emerson, Secretary, c/o Norwich University, Northfield, Vt.

Virginia: Turner N. Burton, Assistant Secretary, Finance Building, P. O. Box 1-X, Richmond, Va.

Washington: Edward C. Dohm, Executive Secretary, Department of Licenses, Olympia, Wash.

West Virginia: Junius T. Moore, Secretary, 215 Morrison Building, Charleston, W. Va.

Wisconsin: W. A. Piper, Secretary, State Capitol, Madison 2, Wis.

Wyoming: Miss Wilma Hageman, Assistant Secretary, 201 State Capitol Bldg., Cheyenne, Wyo.

Management and Politics in Great Britain

CURRENT British concepts of management from three major political points of view were reviewed in the November, 1949, Newsletter of the National Management Council of the U. S. A., New York, N. Y. The statements are of interest to American engineers because most of the economic factors at work in Britain have a counterpart in the American union-management picture. Most revealing is the relative emphasis given by the three schools of thought to the various operations of management such as economic planning, division of responsibility, incentive, opportunity for the individual, and the need for efficiency.

The statements follow:

Labor View

"The managers and owners of private industry are trustees to the nation; in this sense all business is the nation's business. We cannot allow anyone to pursue his own selfish interest guided solely by the profit motive. All employers have the duty to observe proper standards of wages and welfare and to provide for joint consultation.

"Economic planning is essential. Only thus can full employment be maintained. Controls over capital investment, distribution of industry, industrial building, and foreign exchange will be required as permanent instruments of planning in a thriving economy, but controls made necessary by shortages will be removed whenever such action is in the public interest.

"Labor wants to see management, workpeople, the consumer, and the Government join forces in industrial development. Government aid for the application of scientific advances to industry will be continued and increased. In technical assistance, the Government will continue to aid and advance the work of the British Institute of Management and the production efficiency of the Board of Trade.

Labor's aim is to give ample opportunity for drive, public spirit, and scope for individuality from bottom to top.

"New leadership must have its chance to emerge and the trades unions have a great responsibility to educate their members in production problems so that they can take the fullest part in formal and informal consultations at all levels.

"In addition to the workers and managers, the consumers, too, must have their say, and the present consumers' councils must be built up into powerful organizations for the protection of the consumer."

Conservative View

"Our present economic circumstances lay ever greater stress on the need for a high level of efficient production. The standard attained will inevitably depend in large measure on the ability and keenness of management.

"Our first aim will be to restore incentive to management. This we will achieve by reducing the present penal level of taxation and by insuring that exceptional ability and hard work once more receive their due encouragement and additional reward.

"Second, we will provide management with wider opportunities for responsibility, initiative, and enterprise than are possible in the overcentralized and overcontrolled situation of today. We will put a stop to further nationalization and restore private enterprise where practicable. In those industries which must of necessity remain nationalized, we will embark on a policy of drastic decentralization and establish a high degree of local control and responsibility.

"We recognize the need for a general economic plan, but the practical implementation of that plan must be left to the men on the spot in industry with the minimum of interference. We shall seek every opportunity to reduce controls and shall see that those which must be retained in view of continuing shortages hamper initiative and efficiency as little as possible.

"Since the complexity of modern conditions makes frequent contact between Government and industry inevitable, more effective arrangements must be made for consultation so that industry is always able to make its opinions known and to put its knowledge and experience at the Government's disposal. Many questions of principle in the Government's economic policy are best suited to at least a preliminary discussion by representatives of industry.

"Since the problems of industry are first of all human problems and since, whether units are large or small, nationalized or free, continuous attention must be given to the personal relations between management and labor."

Liberal View

"The next two years will decide whether Great Britain continues to exist as an industrial country. As an island country, densely populated, unable to produce more than 60 per cent of the food we consume, dependent upon overseas sources for raw materials for our factories, we perish unless we can produce goods which other countries are willing to buy, at the price which they are willing to pay.

"Only the most efficient management of our industries will enable us to do all this. All unnecessary controls over materials and labor must be eliminated, and Government interference in industry cut to the minimum. But that alone is not sufficient. It is necessary that a complete change in outlook on what is the purpose of industry should take place in the minds of these who should be two great partners in industry, that is, capital and labor.

"When capital and labor accept the fact that the purpose of industry is to provide such goods and services as the consumer needs and wants, and to assist in raising the standard of living by providing these in ever-increasing quantities at lower and lower prices, then the way will be open for management to do its job effectively.

"Consumers would benefit by more goods at lower prices; labor and capital would benefit by having a large surplus in which to share, for where management is able to operate at the maximum efficiency, low costs, good wages, and profits go hand in hand."

Awards

THE John Fritz Medal for 1950 was presented to Walter Hull Aldridge, president of the Texas Sulphur Company, at a special dinner attended by approximately 80 engineers at the University Club, New York, N. Y., Nov. 16, 1949, given by the American Institute of Mining and Metallurgical Engineers in Mr. Aldridge's honor.

The medal, established in 1902, is sponsored jointly by the four Founder Engineering Societies—American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, and American Institute of Electrical Engineers. It was awarded to Mr. Aldridge, who has been a leading figure in sulphur production in America through the world wars, "as engineer of mines and statesman of industry, who by his rare technical and administrative skills has importantly augmented the mineral production of our country and Canada, and who by giving unselfishly of his wisdom and vision has guided his professional colleagues to higher achievements."

* * *

J. KEITH LOUDEN, Mem. ASME, vice-president and assistant to the president, York Corporation, York, Pa., was presented with the Gilbreth Award for his contributions to the advancement of scientific management at the annual banquet of the Society for the Advancement of Management at the Hotel Statler, New York, N. Y., on Nov. 3, 1949.

The Gilbreth Award is named in honor of Frank and Lillian Gilbreth, pioneers in scientific management, and is awarded annually.

* * *

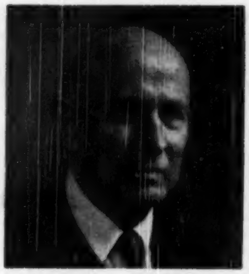
WILLIAM H. McADAMS, Mem. ASME, professor of chemical engineering, Massachusetts Institute of Technology, was awarded the William H. Walker Award for his work in heat transfer by the American Institute of Chemical Engineers. The Walker Award, named for the late William Walker, has been given since 1936 for distinctive contributions to the literature of chemical engineering.

* * *

THE A. McLaren White Award given every year by the American Institute of Chemical Engineers to the winner of a problem contest in chemical engineering, this year went to William E. Henderson, who was valedictorian of the 1949 graduating class, University of Illinois. Second prize was won by Irving Begelman, a graduate of Cooper Union. James W. Crawford, Harry H. Hilp Fellowship student at the University of California, won third prize.

* * *

EDWARD G. SCHEIBEL, chemical engineer, Hoffman La Roche, Inc., Nutley, N. J., won the Junior Award of the American Institute of Chemical Engineers. The Junior Award is a yearly event of the Chemical Engineers and its purpose is to stimulate worthwhile contributions to the science and literature of chemical engineering.



WALTER HULL ALDRIDGE, 1950 JOHN FRITZ MEDALIST

* * *

MOTT SONDERS, JR., head of the chemical-engineering research section, Shell Development Company, Emeryville, Calif., received the 1949 Celanese Corporation of America Professional Progress Award in Chemical Engineering. He received the award at the annual meeting of the American Institute of Chemical Engineers which was held at the Hotel William Penn, Pittsburgh, Pa.

Education

THE University of Michigan school of public health will conduct a short course in air pollution, February 6, 7, and 8, 1950.

Among the topics to be discussed are: Physiological effects of air pollution, the community problem, contaminants, factors involved in pollution and correction, air-cleaning devices, and pollution and controls.

The course is designed especially for the benefit of air-pollution-control and other public officials, engineers, and industrial hygiene personnel. Applications for enrollment in the course should be submitted in writing to the School of Public Health, University of Michigan, Ann Arbor, Mich. The enrollment fee is $5.

* * *

A LABORATORY has been established by the graduate school of Stevens Institute of Technology, Hoboken, N. J., for its recently opened department of fluid dynamics.

Situated on the campus on the third floor of the Navy Building, the laboratory will augment the educational program of the department. In addition, it will provide facilities for fundamental research and is designed for study toward the understanding of the mechanics of fluid flow by visualization processes such as shadowgraphy, striation photography (schlieren), and interferometry. Small-scale apparatus, especially suited to this purpose, is employed. A two-dimensional wind tunnel designed by Dr. B. K. Erdoss, Mem. ASME, professor of fluid dynamics and chairman of the department, is being built in the laboratory; a shock tube is under design and development, and a water tunnel is planned for the future.

The department of fluid dynamics was established in 1949 and co-operates with the Experimental Towing Tank of Stevens Institute of Technology in offering ten courses on the subjects of theoretical and applied hydrodynamics, research methods, etc.

Engineering Literature

Recent ASME Publications

THE preconference lectures presented at the 21st Oil and Gas Power Conference of the ASME Oil and Gas Power Division held at Chicago, Ill., April 25–29, 1949, have just been published by The American Society of Mechanical Engineers in the form of a 127-page booklet, "Gaseous Fluid Flow in Relation to Diesel and Internal-Combustion-Engine Design."

Three lectures composed the course. They were "Cooling of Spark-Ignition Engines," by Benjamin Pinkel, chief, Fuels and Thermodynamics Division, National Advisory Committee for Aeronautics; "Fundamentals of Air Flow in Diesel-Engine Manifolds," by W. W. Hagerty and L. Talbert, professors, University of Michigan, Ann Arbor, Mich.; and "Reduction in Noise of Engines," by W. P. Green, professor, Illinois Institute of Technology, Chicago, Ill.

The lectures are well illustrated and contain a large number of useful charts. Price per copy is $2.

Compressors and Exhausters

A test code for centrifugal, mixed-flow, and axial-flow compressors and exhausters prepared by the ASME Power Test Code Committee No. 10 of The American Society of Mechanical Engineers has recently been published by The American Society of Mechanical Engineers.

The 43-page code, PTC 10-1949, covers rules for conducting tests on a compressor to determine under specified conditions one or more of the following qualities: (1) quality of air or gas delivered; (2) pressure rise produced; (3) power required for compression; and (4) efficiency of the compressor.

While the code is essentially a revision of the 1934 Test Code for Centrifugal Compressors and Exhausters, it has been broadened to include the testing of superchargers, and axial-flow compressors and apparatus for handling gases other than air. Price per copy is $1.50.

T-Slots

Another recent publication of The American Society of Mechanical Engineers is the American Standard "T-Slots—Their Bolts, Nuts, Tongues, and Cutters" prepared by the Sectional Committee on the Standardization of Small Tools and Machine Tool Elements, B5, under the procedures of the American Standards Association. The standard is a revision of the 1941 edition. Certain clarifying statements were added but no changes have been made to the basic dimensions. Price is 45 cents.

Copies of ASME publications may be obtained from ASME Publication Sales, 29 West 39th Street, New York 18, N. Y.

Synthetic Liquid Fuels

MORE than 725 individual references to Bureau of Mines investigations on the production of liquid fuels from oil shale, coal, lignite, and natural gas are contained in a revised bibliography on synthetic-liquid-fuel publications released recently by the Bureau of Mines.

A free copy of the report, Information Circular 7534, "Revised Bibliography of Bureau of Mines Investigations on the Production of Liquid Fuels From Oil Shale, Coal, Lignite, and Natural Gas (to 1949)," may be obtained by writing to the Bureau of Mines, Publications Distribution Section, 4800 Forbes Street, Pittsburgh 13, Pa.

Gas Turbines

A NEW and complete bibliography of books and published reports on gas turbines, jet propulsion, and rocket power plants has just been published by the National Bureau of Standards and is now available from the U. S. Government Printing Office.

It is Circular 482, "Bibliography of Books and Published Reports on Gas Turbines, Jet Propulsion, and Rocket Power Plants," by Ernest F. Fiock, and may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Price is 20 cents.

Meetings of Other Societies

Jan. 9–13, 1950
Society of Automotive Engineers, Inc., annual meeting and engineering display, Hotel Book-Cadillac, Detroit, Mich.

Jan. 18–20
American Management Association, general management meeting, St. Francis Hotel, San Francisco, Calif.

Jan. 18–20
American Society of Civil Engineers, annual meeting, Hotel Commodore, New York, N. Y.

Jan. 23–26
American Society of Heating and Ventilating Engineers, 56th annual meeting, Hotels Adolphus and Baker, Dallas, Texas

Jan. 30–Feb. 3
American Institute of Electrical Engineers, winter meeting, Hotel Statler, New York, N. Y.

Feb. 26–March 1
American Institute of Chemical Engineers, regional meeting, Hotel Rice, Houston, Texas

Feb. 27–March 3
American Society for Testing Materials, committee week and spring meeting, Hotel William Penn, Pittsburgh, Pa.

March 14–16
Society of Automotive Engineers, Inc., passenger car, body, and production meeting, Hotel Book-Cadillac, Detroit, Mich.

March 26–30
American Chemical Society, 117th national meeting, Houston, Texas

(*For ASME Calendar of Coming Events see page 105*)

Notes on Coming Meetings

Air Conditioning

THE Southwest Air-Conditioning Exposition, under the auspices of the American Society of Heating and Ventilating Engineers, will be held Jan. 23–27, 1950, at State Fair Park, Dallas, Texas. It has enrolled approximately 200 displays by manufacturers of every type of equipment used in heating, ventilating, and air-conditioning buildings of every kind and for all purposes. More forcibly than at any previous exposition of its kind, exhibits should reflect the result of air-conditioning design on the construction industry.

Plant Maintenance

LESTER C. MORROW, Mem. ASME, coeditor, *Factory Management and Maintenance*, will act as chairman of a conference, at which a group of 21 experts will lead a discussion of plant-maintenance problems, to be held concurrently with the Plant Maintenance Show at the Auditorium, Cleveland, Ohio, Jan. 16–19, 1950. The conference is being sponsored by The American Society of Mechanical Engineers and the Society for the Advancement of Management.

Topics for the four-day conference include maintenance-management principles; maintenance cost; light equipment; upkeep of motors, controls, distribution equipment, floors, walls, and roofs; use of electrical instruments in maintenance; relationship of color and light to production; sanitation; lubrication; use of service equipment; and personnel safety. The Cleveland Engineering Society will sponsor a dinner for guests.

Industrial Health

ENGINEERS are invited to attend the tenth annual Congress on Industrial Health, American Medical Association, to be held at the Hotel Roosevelt, New York, N. Y., Feb. 20–21, 1950. One of the features of the program will be a symposium on "Human Relations in Business and Industry" on February 21.

Power

"ECONOMY in Power" will be the theme of the twelfth annual Midwest Power Conference to be held at the Sherman Hotel, Chicago, Ill., April 5, 6, and 7, 1950.

People

C. A. ADAMS, Fellow ASME, who has been serving as the chairman of the Welding Research Council since its beginning, was elected honorary chairman at the annual meeting held in New York, N. Y., Nov. 3, 1949. H. C. Boardman, Mem. ASME, who has been serving as vice-chairman, was elected chairman, and A. B. Kinzel was elected vice-chairman. Dr. Adams was the first president of the American Welding Society, and the first director of the American Bureau of Welding, which position he held until the bureau was discharged and the Welding Research Council was organized under the Engineering Foundation in 1935. Mr. Boardman is research director of the Chicago Bridge and Iron Company, and an honorary member of the American Welding Society. Dr. Kinzel is president of the Union Carbide and Carbon Research Laboratories, Inc., and past-chairman of the Engineering Foundation Board.

* * *

NICHOLAS J. HOFF, Mem. ASME, professor of aeronautical engineering, Polytechnic Institute of Brooklyn, N. Y., is the first American aeronautical scientist to win the medal of the Swedish Society of Engineers.

Dr. Hoff received the medal on a recent visit to Sweden where he presented a paper before the society. It was awarded in recognition of his scientific achievement and as a token of gratitude for his activities during his visit.

* * *

EDWARD C. MEAGHER, treasurer, Texas Gulf Sulphur Company, New York, N. Y., was re-elected president of the United Engineering Trustees, Inc., at its annual meeting in New York, N. Y.

Other officers re-elected were: Irving V. A. Huie (ASCE), president of the Board of Water Supply, New York, N. Y.; James F. Fairman (AIEE), vice-president of Consolidated Edison Company of New York, as vice-president; Kurt W. Jappe (ASME), retired director of purchases, Hercules Powder Company, Wilmington, Del., as treasurer; James L. Head (AIME), Department of Mines, Chile Exploration Company, New York, N. Y., as assistant treasurer. John H. R. Arms (AIME, ASME), was re-elected as secretary.

* * *

JOHN G. BERGDOLL, JR., vice-president and general works manager of York Corporation, York, Pa., was elected president for 1950 of the American Society of Refrigerating Engineers at the final session of the 45th annual meeting of the society held at the Edgewater Beach Hotel, Chicago, Ill.

ASME Elects Eight Fellows

THE American Society of Mechanical Engineers has honored eight of its members by electing them to the grade of Fellow of the Society.

To be qualified as a nominee to the grade of Fellow one must be an engineer who has acknowledged engineering attainment, 25 years of active practice in the profession of engineering or teaching of engineering in a school of accepted standing, and has been a member of the Society for 13 years. Promotion to the grade of Fellow is made only on nomination by five Fellows or members of the Society to the Council, to be approved by Council.

The men who, by virtue of their contribution to their profession and to the Society, were so honored are:

Carl Frederick Dietz

Carl Frederick Dietz, president of Lamson Corporation of Delaware, Syracuse, N. Y.; New York Mail and Newspaper Transportation Company, New York, N. Y.; and Boston Pneumatic Transit Company, Boston, Mass., has a record of 46 years of outstanding engineering service. His dry treatment of lead-silver ores was first accomplished while he was engaged in designing and operating mills for the treatment of complex ores at mining properties in the United States and abroad. He organized and led an engineering expedition to South America in search of bauxite deposits. He developed the first type of vitamin D enriched flour. He has been a leader in the manufacture of materials-handling equipment.

Paul R. Duffy

Paul R. Duffy, power engineer, The Youngstown Sheet and Tube Company, Youngstown, Ohio, earned the money for his college expenses and tuition as a part-time mechanical supervisor and power-plant engineer for the Norfolk and Western Railway Company at Roanoke, Va., and Portsmouth, Ohio. When the U. S. Railroad Administration was formed during World War I, he was selected for the post of superintendent of steam and electric-power generation—Potomac district. From that time on he has specialized in industrial power-plant engineering and has closely followed the development of high-pressure high-temperature steam generators and station auxiliaries.

With a small group of engineers he in a large measure was responsible for the reactivation of the ASME Youngstown Section in 1946. He has contributed many papers to the field of technical literature.

Ernest M. Gilbert

Ernest M. Gilbert, chairman of the board and chief engineer, Gilbert Associates, Inc., Reading, Pa., is one of the outstanding men in the country in the design and construction of power plants. In addition to pioneering work in his developing years with various companies from 1900 to 1916, his work with W. S. Barstow and Company is noteworthy. Mr. Gilbert was in charge of design and construction of a plant at Holland, N. J., for the New Jersey Power and Light Company which in 1929 was the first 1200-lb station in the United States, designed and built as such, using 1400-lb boilers and 750 deg superheat. When put into operation it was named the Gilbert Station in honor of the man who designed it and supervised its construction. At present, as chief engineer of his own firm, Gilbert Associates, Inc., he is in charge of the new Titus Station under construction near Reading, Pa., for the Metropolitan Edison Company, a plant which will have two 75,000-kw units.

Charles E. Lehr

Charles E. Lehr, retired chief engineer, Bethlehem Steel Company, Bethlehem, Pa., had been in the employ of the company since 1891. In 1898 he entered the engineering department and supervised design as squad leader. He was advanced to second assistant chief engineer in 1904 and became chief engineer in 1908.

During his service as chief engineer he was in charge of the design of all major construction as well as maintenance of buildings and facilities throughout the plant. Some of the projects completed under his supervision include: The layout of Saucon Division, coke ovens and by-products plants, ammunitions plant during World War I, construction of 1200-ton blast furnace; and development of emergency facilities for National Defense during World War II. He contributed many papers on rolling-mill practice flow sheets.

David W. R. Morgan

David W. R. Morgan, vice-president, South Philadelphia (Pa.) Works, Westinghouse Electric Corporation, has been with Westinghouse since 1913. For the period 1917 to 1926 he was in responsible charge of all engineering pertaining to surface, jet, and barometric-type condensers, on all types of centrifugal pumps, including hydraulic air pumps and air ejectors. From 1926 to 1940, in addition to these responsibilities, he was in direct charge and responsible for the design of the construction of high-speed Diesel engines. Then from 1941 to 1944 he was responsible for all manufacturing operations at the South Philadelphia Works of the Westinghouse Electric Corporation. For the period 1944 to 1946 he directed and was responsible for the over-all operations of the steam division, South Philadelphia Works, including manufacturing, engineering, and sales.

For the period 1946 to date, he has been in charge of the entire operation at the South Philadelphia Works, Attica Works, and an additional new plant at Kansas City; which embraces the over-all activities of the steam division, aviation gas-turbine division, and stoker division.

He has been active in the business of the ASME and has served on the Condenser Research Committee, Power Test Codes Committee No. 12, has been vice-president and member of the Executive Committee; and chairman, Admissions Committee.

Macdonald Seymour Reed

Macdonald Seymour Reed, member of the board of directors, chief engineer, Erie Foundry Company, Erie, Pa., designed and patented a new type of broad drop hammer which made it practicable to build hammers of this type in sizes about twice as large as those previously feasible. He has designed and built many steam drop hammers rated at 35,000 lb reciprocating weight, which is more than double the maximum size of hammers of this type of 15 or 20 years ago. Construction of these large drop hammers made possible the manufacture of many vital parts including large aluminum propeller blades, aluminum, and later, alloy-steel crank cases for fixed radial-type airplane engines, large drop-forged Diesel-engine crankshafts up to 10 or 12 ft in length. During the war his duties included designing and supervising the construction of shops for the manufacture of heavy machinery and the purchase and installation of equipment.

He has contributed a number of articles on the subject to technical publications.

Byron Elliott Short

Byron Elliott Short's contribution to the advancement of the science of engineering has been threefold. As a teacher of mechanical engineering the quality of his work has been regarded throughout this twenty-three year period as outstanding by those who are in a position to judge the true worth of contribution to the enlightenment and encouragement of prospective engineers. As an engineering administrator, early in his teaching career, he assumed the responsibility of developing the heat-power laboratory of the University of Texas. His work as chairman of the department of mechanical engineering of the University of Texas was of an outstanding nature. His service as acting dean of the college of engineering, The University of Texas, Austin, Texas, was rendered with distinction and diplomacy. He is the author of the book entitled "Flow, Measurement, and Pumping of Fluids."

Ralph L. Thomas

Ralph L. Thomas, vice-president, Consolidated Gas Electric Light and Power Company of Baltimore (Md.), made most of his contributions to the advancement of the science of engineering in his economic studies relating to the effective co-ordination of hydro and steam-power sources in interconnected electric systems such as those with which he has been associated. During his employment with Pennsylvania Water and Power Company he negotiated numerous wholesale power contracts with other utility companies and was responsible for their operation. This experience with the economics of hydro and steam power led to many contributions to the technical literature on the subject, particularly to the annual reports of the Prime Movers Committee of the National Electric Light Association.

Mr. Thomas was responsible for the economic studies of the feasibility of building and operating the Safe Harbor Hydroelectric Project, a 230,000-kw plant on the Susquehanna River. As a direct result, Safe Harbor was the first large low-head plant in America to use the Kaplan-type turbine which had been developed in Europe. He was subsequently responsible for all negotiations with the regulatory bodies, the success of which contributed to rapid construction progress.

ASME NEWS

Members and Students Luncheon Addressed by ASME Officers and Guests

ONE of the interesting events of the Annual Meeting took place in the grand ballroom of the Hotel Statler, on Thursday, December 1, when members and students attended the luncheon given especially for student members from all sections of the country.

Guest of Honor—H. J. Gough

After a friendly, social hour of dining, James M. Todd, president, ASME, and toastmaster, opened the meeting by introducing to the members the guest of honor, H. J. Gough, president of The Institution of Mechanical Engineers, London, England. Mr. Todd then told the audience that there are 134 student branches of the Society, with 21,000 student members, and that approximately $47,000 is spent each year from income in sponsoring student relations over and above the dues which the student members pay. This luncheon, explained President Todd, is an example of our interest in students. It is attended by quite a large number of students out of the New York metropolitan area, and, said President Todd, "As Mr. Hartford put it, there are a few students from the Metropolitan area." Plant trips are arranged for the out-of-town students because the Society wants them to see the things here of interest to them. "You young men," said President Todd, "go through three stages of development: First, physical development over which we have no control; second, your educational activities, which we do have something to do with through the Engineers' Council for Professional Development; and third, the ability in you to make a place in the world, and this is something that we do want to have a part in, and that is why we interest ourselves so much in student activities."

The Old Guard

President Todd then introduced Frederick D. Herbert, representing the "Old Guard," consisting of members who have paid dues for more than 35 years and continue to do so even though they are freed from this obligation, so that a fund can be maintained to support the luncheon and to provide awards to students. This year the Old Guard contributed $150 toward the student-luncheon tickets.

L. Austin Wright, secretary of The Engineering Institute of Canada, was then introduced, C. E. Davies, secretary, ASME, was saluted, and then the president-elect, James D. Cunningham of Chicago, Ill., expressed his appreciation of the high honor which the Society had conferred upon him.

Awards

Next on the program was the awarding of prizes by Ely C. Hutchinson, chairman of the Board on Honors.

George D. Lewis, Junior ASME, graduate of the University of Connecticut, received the Undergraduate Student Award, for his paper "Some Natural Limitations on Space Travel."

Daniel R. Fisher, graduate of Rensselaer Polytechnic Institute, received the postgraduate student award for his paper "The Effect of Evaporative Cooling on a Compressible Fluid Flowing in a Duct."

Stanley M. Kovacheff, Jun. ASME, graduate of the University of Detroit, received the Charles T. Main Award for his paper "The Increasing Importance of Science in Engineering."

Dr. P. S. Myers, Speaker

Phillip S. Myers, member ASME, recipient of the Pi Tau Sigma Gold Medal, was the speaker on this occasion. His subject was "Thermodynamics of Human Mixtures." A brief summary of his address follows:

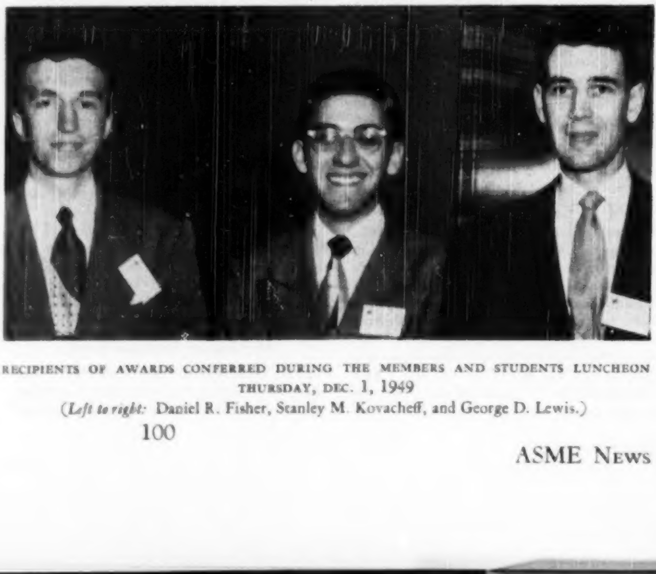
Dr. Myers remarked that when he was asked to confine his address to twenty minutes he was somewhat disturbed. He could prepare a five-minute speech, with introduction, jokes, and closing remarks, or an hour's talk, for, he said, any professor could talk for an hour and say nothing, but what could he choose for a 20-minute speech? So he went to Literature, and found nothing; then he asked his students to help him, and they all suggested that "there isn't but one subject of universal interest to all engineers, and that subject is WOMAN," but Mrs. Myers stopped that from being used. So he prepared a questionnaire, "What characteristics do you think are essential for the professional success of an engineer. Out of the many replies these six items were listed:

1 Character, 24 per cent
2 Judgment, $19^1/_2$ per cent
3 Efficiency, 16 per cent
4 Understanding of men, 15 per cent
5 Knowledge of engineering fundamentals, 15 per cent
6 Ethics and practice in business, 10 per cent

Dr. Myers placed the human mixture into three classes or levels, the individual, national, and international. The smallest of human mixtures was the home, and he said that from present statistics approximately one third of the homes will fail. The national level, which is affected by race riots, lynchings, and strikes, and the international human mixture, the cold war, and the hot war, where, in this situation, if science is to be of benefit to mankind, we must work toward solving this confusion and bring order to the human mixture.

He then classified the human mixture into the "first law equation in which "input" and output" are equal. The input items were: First, health, physical, mental and moral; second, the ability to do work, work in the broadest sense, which means more than just the time required to earn a livelihood—the time one spends outside the time one works for a living; third, honesty—quality as well as quantity; four, a sense of humor—which makes things go a little smoother; five: continuing concern for the other fellow, the first and second mile which are the letter of the law and the spirit of the law, respectively.

The output items, he said, were: First: material benefits, a decent living for ourselves and our families; second; measure of achievement; success, ideals of success in politics, family life, church life, etc.; third is the respect of our fellow men. This is not something we



RECIPIENTS OF AWARDS CONFERRED DURING THE MEMBERS AND STUDENTS LUNCHEON THURSDAY, DEC. 1, 1949

(*Left to right:* Daniel R. Fisher, Stanley M. Kovacheff, and George D. Lewis.)

work for directly but is something which comes to us and is our due as the result of our input items. Four; satisfaction. We hope to obtain satisfaction from our life, our work, our contacts with our family and other human relations.

Dr. Myers then explained the second law of thermodynamics in terms of these input and output items of human mixtures, which, in essence, is "Do unto others as you would they would do unto you." He pointed out that an understanding of the laws of human mixtures essential to professional success show in human relations as in thermodynamics, that "you cannot get more out of the human mixture than you put into it."

ASME Board and Committee Appointments

AT THE 1949 ASME Annual Meeting, held at the Statler Hotel, New York, N. Y., Nov. 27-Dec. 2, 1949, the following appointments to ASME Boards and Committees were approved: Board on Honors, Medals Committee: L. J. Cucullu (5-year term). Professional Divisions Committee: T. F. Perkinson (5-year term). Publications Committee, Advisory Member, Region V, H. N. Blackmon. EIC-ASME Joint Conference Committee: A. G. Christie, A. C. Pasini, Thomas E. Purcell, and C. R. Davis.

National Management Council, alternate to H. B. Maynard: Lillian M. Gilbreth. Special Research Committee on Furnace Performance Factors: Lyle B. Schueler. ASA Committee on Safety Code for Rubber Machinery, B28: G. L. Bruggmeier. ASA Sectional Committee on Petroleum Products and Lubricants (Z11): C. L. Pope. ECPD Committee on Engineering Schools, Region III Committee: Leonard J. Fletcher.

ASME Spring Meeting to Be Held in Washington, D. C. April 12–14, 1950

SPRING, cherry blossoms, a sesquicentennial celebration, and one of the most beautiful cities in the world are ingredients for any successful meeting, but when one adds to it a center of science and research and the seat of a government currently engaged in projecting American engineering know-how overseas for the benefit of war-devastated and undeveloped areas, the combination creates an appeal for engineers that should be hard to resist.

The Washington, D. C., Section of The American Society of Mechanical Engineers, which knows all the by-ways of Washington, D. C., is planning a program of technical sessions, social events, and inspection trips for the ASME 1950 Spring Meeting to be held at Hotel Statler, Washington, D. C., April 12-14, 1950, which makes the most of what their city has to offer. Already, with only a bare outline of the program available, it is apparent that the Meeting will be a memorable one.

Older members will remember the Fiftieth Anniversary Celebrations of The American Society of Mechanical Engineers in 1930 when the Society last held a national meeting in the Nation's capitol. Since that time so much has happened in the way of government support of science and engineering, that an engineering meeting in Washington with its research laboratories and scientific institutions, has special significance for mechanical engineers.

Twenty-two sessions are being scheduled under the sponsorship of 16 of the Society's professional divisions and committees as follows: Aviation, 2; Fuels, 2; Gas Turbine Power, 2; Heat Transfer, 1; IIRD, 2; Machine Design, 2; Management, 1; Oil and Gas Power, 1; Power, 2; Process Industries, 1; Wood Industries, 1; American Rocket Society, 1; Education, 1; Cutting Fluids, 1; Effect of Temperature, 1; Safety, 1.

Two luncheons and a banquet are planned at which speakers of national and international standing will address the Society on current topics.

Special conducted tours are being arranged to the Naval Gun Factory, Naval Research Laboratory, and Naval Ordnance Laboratory, with other trips to the Bureau of Standards, Fort Belvoir, and the Timber Engineering Laboratories. An event of special interest to the women will be a visit to the Naval Academy at Annapolis, Md.

ASME Woman's Auxiliary Enjoys Interesting Program at 1949 Annual Meeting

Mrs. R. B. Purdy Re-Elected President for 1950

THE Woman's Auxiliary of the Metropolitan Section of The American Society of Mechanical Engineers arranged an interesting program which was enjoyed by 375 members and guests of the Auxiliary who registered during the 1949 Annual Meeting held at the Hotel Statler, New York, N. Y., Nov. 28-Dec. 2, 1949, which marked the 26th anniversary of the Woman's Auxiliary.

The program was under the general direction of Mrs. Frank N. Miller, honorary chairman; Mrs. H. R. Kessler, general chairman; and Mrs. C. H. Kent, vice-chairman.

Monday, November 28, was devoted to greeting and registering our many guests from out of town. The President's Luncheon at noon with Dr. Lillian M. Gilbreth as speaker was well attended.

The outstanding event of the day was the Annual Tea Dance held in the Georgian Room of the Hotel Statler from 5 to 7 o'clock. Music was provided by Eddie Worth and his orchestra. This is one of the most attractive functions of the Annual Meeting and the usual good time was had by the many guests who attended.

Tuesday morning, November 29, Mrs. Carl F. Kayan took the women on a bus trip and guided tour to the Cathedral of St. John the Divine. At the conclusion of this trip luncheon was served at the Engineering Woman's Club, Two Fifth Avenue.

MRS. JAMES D. CUNNINGHAM SERVING TO MRS. G. E. HAGEMANN AT THE MONDAY AFTERNOON TEA

1950 Officers

The annual business meeting was held at Hotel Statler on Wednesday, November 30, with the National President, Mrs. Randall B. Purdy, presiding. After the section reports, the officers for the ensuing year were announced as follows: President, Mrs. R. B. Purdy; 1st vice-president, Mrs. F. N. Miller; 2nd vice-president, Mrs. J. P. Harbeson, Jr.; 3rd vice-president, Mrs. C. M. Hickox; 4th vice-president, Mrs. A. B. Apenshaw; 5th vice-president, Mrs. R. R. Robertson; recording secretary, Mrs. A. M. Feldman; corresponding secretary, Mrs. J. M. Labberton; treasurer, Mrs. C. H. Young; and assistant treasurer, Mrs. C. Gladden.

The gathering was addressed by President Todd, and also by President-Elect Cunningham. Following the meeting, the annual luncheon was held in the Music Room of the Biltmore Hotel with Mrs. Irene Peters as guest speaker. Mrs. E. A. Lundstrom was chairman. The evening was devoted to the Annual Banquet and Honors Night where the usual festivities prevailed.

Wall Street Tour Enjoyed

Thursday, December 1, a guided tour of Wall Street, including the Stock Exchange, Cotton Exchange, and the Federal Reserve Bank, was arranged by Mrs. William L. Iliff expressly for the Woman's Auxiliary and the many guests from out of town. An unusual number attended this function and enjoyed it very much, thus ending the planned program for the year.

The program was marred by two sudden cancellations of inspection trips of the *Britannic* and *Mauretania*, which very much distressed members of the Woman's Auxiliary of the Metropolitan Section.

Reported by Mrs. H. R. KESSLER, general chairman, ASME Metropolitan Section.

Notice of Importance to All ASME Members

Nominations Open for 1951 Officers

THE 1950 National Nominating Committee of the Society is now requesting proposals for candidates for the offices to be filled during 1950, which are as follows:

President	To serve 1 year
Vice-President	To serve 2 years Region II
Vice-President	To serve 2 years Region IV
Vice-President	To serve 2 years Region VI
Vice-President	To serve 2 years Region VIII
Directors at Large (2)	To serve 4 years

Early Action Necessary

Proposals for the Society's membership will be welcomed by the Committee, and those who intend to submit them are urged to act promptly. Candidates' names and records should be submitted on the official prop sal form which may be obtained from the Secretary or any member of the Nominating Committee as listed below. Completed forms should be sent to the Committee through the Secretary, Claude L. Huey, Babcock & Wilcox Company, 1604 Candler Building, Atlanta, Ga., not later than April 1, 1950.

Before submitting the name of a candidate, his consent to serve should be obtained by the proposer. The proposer, not the candidate, should fill out the form. Members are reminded that, in accordance with the Society's Constitution, candidates for the office of President, Vice-President, and Director at Large shall be of the Grade of Fellow or Member of the Society.

Members wishing orally to support the candidacy of a proposed nominee will be given an opportunity to do so at the Committee's open hearings at the Semi-Annual Meeting in St. Louis, June 19–23, 1950—Hotel Statler.

You and Democracy

THE search for good men to lead the Society is the privilege and responsibility of every member. The search must begin at the grass roots, in the byways of our industrial centers, in all the Regions and Sections, where engineering administrators and leaders are demonstrating their ability.

In a democratic organization each man must accept responsibility. You, as a member of the ASME, have the responsibility to nominate for national office the members in your industry or community whose leadership can benefit the ASME.

Unless you act, the democratic process cannot function. The ASME Nominating Committee does not initiate nominations. It is your service agency whose sole function is the selection from the leaders you name, the most able of the able, a slate of officers, which you as a member can approve or reject by national ballot.

The time to act is now. The Nominating Committee is accepting nominations for 1951. Write to the secretary for a nomination form. Write to the member on the Nominating Committee from your Region. Share with the nation the superb leadership developed in your Region.

1950 National Nominating Committee

Region I: Zenas R. Bliss, division of engineering, Brown University, Providence, R. I.; Alfred J. Ferretti, *1st Alt.*, Northeastern University, 360 Huntington Ave., Boston 15, Mass.; Harry E. Harris, *2nd Alt.*, 229 Thorme St., Bridgeport 6, Conn.; and Charles H. Coogan, Jr., *3rd Alt.*, Mechanical Engineering Department, The University of Connecticut, Storrs, Conn.

Region II: V. Weaver Smith, The Lummus Company, 420 Lexington Ave., New York 17, N. Y.; Paul T. Onderdonk, *1st Alt.*, Consolidated Edison Company of New York, Inc., 4 Irving Place, New York 3, N. Y.; Kenneth J. Moser, *2nd Alt.*, Stevens Institute of Technology, Hudson St., Hoboken, N. J.

Region III: Henry H. Snelling, Snelling & Hendricks, 900 F Street, N.W., Washington 4, D. C.; William G. McLean, *1st Alt.*, Department of Mechanics, Lafayette College, Easton, Pa.; C. B. Campbell, *2nd Alt.*, steam division, Westinghouse Electric Corporation, Lester Branch P. O., Philadelphia 13, Pa.

Region IV: Claude L. Huey, Babcock & Wilcox Company, 1604 Candler Building, Atlanta, Ga.; Ervin M. Williams, *1st Alt.*, Clinchfield Fuel Company, Box 410, Spartanburg, S. C.; J. Marshall Johnson, *2nd Alt.*, Tennessee Valley Authority, Power Building, Chattanooga, Tenn.

Region V: John W. Brennan, hydraulic coupling division, American Blower Corporation, 8111 Tireman Ave., Detroit 32, Mich.; F. F. Borries, *1st Alt.*, Westinghouse Electric Corporation, 207 W. 3rd St., Cincinnati, Ohio; Cecil R. Davis, *2nd Alt.*, Davis Automatic Controls, Ltd., 5 Blackmore St., Toronto 5, Ont., Can.

Region VI: Wm. H. Oldacre, D. A. Stuart Oil Company, 2727 South Troy St., Chicago 23, Ill; Harold A. Bolz, *1st Alt.*, general engineering department, Purdue University, Lafayette, Ind.; Robert T. Mees, *2nd Alt.*, research department, Caterpillar Tractor Company, Peoria 8, Ill.

Region VII: J. Alan Campbell, Westinghouse Air Brake Company, 501 Matson Building, San Francisco 5, Calif.; R. Lannert Iglehart, *1st Alt.*, Shell Development Company, 4560 Horton St., Emeryville 8, Calif.; Albert R. Weigel, *2nd Alt.*, Consolidated Western Steel Corporation, 5700 S. Eastern Avenue, Los Angeles 54, Calif.

Region VIII: Henry B. Atherton, Kansas City Power and Light Company, Postal Station "F", Kansas City 1, Mo.; Venton L. Doughtie, *1st Alt.*, The University of Texas, University Station, Austin 12, Tex.; Glyn Beesley, *2nd Alt.*, Dallas Power and Light Company, 1506 E. Commerce, Dallas 1, Tex.

ASME Junior Forum

COMPILED AND EDITED BY A COMMITTEE OF JUNIOR MEMBERS

Advice on Career Planning Offered at Annual Meeting Junior Session

220,000 Opportunities Exist in Small Companies

A SYMPOSIUM on the junior engineer in 1950 was sponsored by the National Junior Committee of The American Society of Mechanical Engineers as part of the program of the ASME Annual Meeting. As a service to young mechanical engineers, the Junior Committee invited three speakers to discuss what the large corporation offers the junior engineer, the advantages of employment in a small company, and the general employment outlook for mechanical engineers in 1950. More than 100 junior members and guests were present.

D. E. Jahncke, chairman, ASME National Junior Committee presided. He reviewed briefly the work of the Junior Committee, which, he said, was trying to encourage participation by younger engineers in the activities of the Society.

The Large Corporation

The first speaker was M. M. Boring, Mem. ASME, manager of the Technical Personnel Division, General Electric Company, Schenectady, N. Y., who represented the large corporation. Engineering employment, Mr. Boring said, was a two-way street and in industry men are asked usually to give before they receive. Referring to his experience of employing more than 100,000 engineering graduates and observing the unfolding of their subsequent careers, Mr. Boring recommended the large companies as a good place to serve an apprenticeship in industry.

He cautioned young men not "to hitch their wagons to a star" but to keep their minds open about the kind of job they think they want. No one knows, he warned, what the future holds, and a man who decides beforehand on the job or field he is to enter is likely to pass open doors of opportunity.

When a large corporation hires a young man, Mr. Boring continued, it is usually looking for potential talent which can be developed. The men who succeed are those who have the ability to grow, to lead men, and finally to take responsibility.

Referring to engineering salaries, Mr. Boring stated that what a man receives initially depends on the supply and demand of engineers. At the present time there was an oversupply of engineering graduates. He then drew a series of curves representing the upper 10 per cent, upper-quartile, median, and lower-quartile salaries. The curves had the same starting point but diverged with the years. Which of these curves a man would follow depends more on his ability to get along with other men, and his propensity for leadership than on his technical knowledge. Few engineers fail because of lack of engineering ability.

The Five-Year Interval

Commenting on his observation of the professional growth of engineers, Mr. Boring stated that the rungs of the ladder of promotion seem to appear in the life of most engineers at five-year intervals. At the end of such a period it usually happens that the man is ready for more responsibility and is promoted. Referring to the future of engineering jobs, Mr. Boring was optimistic. Nature had a way of disposing of persons like himself, thus providing opportunity for younger men. In the competition for jobs, he advised young men not to worry about older engineers. The competition was with men of their own generation.

The second speaker, Crosby Field, Fellow ASME, and president, Flakice Corporation, Brooklyn, N. Y., spoke on the opportunities in the field of small industry. He agreed with Mr. Boring that the large corporation has much to offer the young engineer in his first years in industry, but that the period of apprenticeship ought not to be extended beyond two or three years. There were 220,000 small plants in this country, Colonel Field said, and each one of them represented a job opportunity for some engineer.

When a young man decides to get into small industry, he should make himself so indispensable to the owner that in order to hold his services, the owner takes him into partnership and makes him part owner of production facilities.

Colonel Field also had something to say about guideposts in making career decisions and the need for risk taking.

Young men who enter the engineering profession because they think they can make plenty of money were not professional material, Colonel Field warned. If they did not intend to study new problems every day in addition to their immediate jobs, if they did not carry engineering problems home from the office, if they did not feel a consuming interest in doing the things of engineering, they were not professionally minded.

"A profession," he continued, "implies character in the individual and within the frame of a social system, freedom for behavior according to his desires. It is not a trade union, nor a legislative pressure group, nor is it a racket; it is composed of individuals acting as individuals. A profession is largely a matter of personality and character accompanied by all-consuming interest in doing the things that make up the profession."

Small or Large Organizations?

One of the major factors in deciding what type of opportunity one should embrace is the "pursuit of happiness." In order to be happy, Colonel Field continued, it is necessary to develop a philosophy of life and to find the true answers to the fundamental questions which transcend the immediate problems of engineering. Answers must be found to such questions as: Which of the two general types of man am I? Am I the type whose inborn nature will be satisfied only by actual ownership? Am I the type to whom ownership is a

SPEAKERS WHO ADDRESSED THE SYMPOSIUM ON THE JUNIOR ENGINEER IN 1950 SPONSORED BY THE NATIONAL JUNIOR COMMITTEE

(*Left to right:* R. R. Behlow, Crosby Field, and M. M. Boring.)

small matter? The answers would indicate whether one's opportunities lie with the large corporation or with a small company, he said.

Addressing his remarks to men who feel they would like to work for others, Colonel Field reviewed the advantages of the large corporation. "You will find a going business, a large group of companionable men, excellent graduate schooling, little risk of one's own money or other capital. You may find interesting work with fascinating equipment which includes samples of the newest and best.

You will share immediately in some degree the prestige of your corporation. Many of you are professional men and if your temperament is suited to this type of life under such conditions, by all means select that course. If you are managerially or politically minded, it affords you one of your best possibilities. Then by all means take this line. To you such work will be appealing, and in your planning do not overlook consideration of the Armed or other Government services."

Rewards of Ownership

On the other hand, Colonel Field said, the reward of successful ownership is independence, a freedom of selection, and perhaps something tangible for old age, but he cautioned young engineers not to go into business for themselves without adequate protection.

"If you do decide to go into your own work, be careful that you do not make the change too soon. The large corporation has many things to give you, and until you have learned enough from them do not take the plunge. Immediately after school continue your present course by taking a job with a large corporation. While you are in large-company operations, prepare yourself by broadening your study of employees. Find out how the other men in your department function and how the men in other departments function. Start early to look into possibilities by contact through placement agencies and even careful use of blind advertising.

"A large company having a good man known to be desirous of getting into a small company may place him with a customer or help him start a business using the company's product, with which he should be familiar and to which he may be favorably disposed. A modification would be to set yourself up as a manufacturer's agent, with the backing of one or more companies.

A Block of Stock

"If, however, a clean break with present employment seems necessary, then the arrangement with the new employer preferably should be a guaranteed salary with a block of stock set aside to be purchased out of earnings on that stock. Many are the varied kinds of arrangements in use today, but they all invoke the taking of considerable risk on the part of the applicant—if business continues to grow, he wins an interest; if it doesn't, he loses interest as well as job." (See "The Small Manufacturing Company as an Opportunity for Engineering Graduates," by Crosby Field, pp. 316-320, April, 1949, MECHANICAL ENGINEERING.)

Risk Taking

Colonel Field advised young engineers to face the future with confidence. "You are facing one of the greatest opportunities that has ever existed in the world's history of a profession. The practice of this profession is in the hands of those who can develop character and leadership. Leadership implies the ability to take risks and successfully overcome them.

"Whether you are in a large business as an employee or whether you are in business for yourself, banish the words 'security' and 'routine' from your mind and resolve that you will so prepare yourself to meet the emergency that you will have a chance of overcoming it should it arise. If you fail at first, learn from your failure. If you start this while still young enough, you will have time to learn by failure, perhaps several times before you become the eventual winner. Without risk takers to lead it, a profession becomes a disappearing trade.

Job Outlook for 1950

The final speaker was R. R. Behlow, regional director, Bureau of Labor Statistics, New York, N. Y., who spoke on "Employment Outlook for Engineers." Mr. Behlow reviewed the growth of the engineering profession and the expansion of the metalworking industries. Employment of mechanical engineers has grown, he reported, from 15,000 in 1910 to 130,000 in 1948. Following a discussion of industrial trends, he stated that employment of 175,000 mechanical engineers by 1960 was expected, an average annual increase in the number of mechanical-engineering jobs of over 3700 for the years following 1948.

ASME Members Televised During Annual Meeting

TWELVE members and guests attending the Annual Meeting of The American Society of Mechanical Engineers participated in the nationally televised program, Court of Current Affairs, sponsored as a public service by the Dumont Network, Nov. 29, 1949.

The question before the court was "Should Jerusalem Be Internationalized?"

The jurors were: Mr. and Mrs. Thomas S. McEwan, Chicago, Ill.; Mr. and Mrs. Ralph L. Morse, Boston, Mass.; Mr. and Mrs. George W. Nigh, Bayonne, N. J.; Mrs. William C. Stewart, Cleveland, Ohio; Justin J. McCarthy, Philadelphia, Pa.; P. L. Houser, Chicago, Ill.; H. O. Croft, Columbia, Mo.; David Larkin, St. Louis, Mo.; and Brig. Gen. S. Reimel (retired), Washington, D. C,

What viewers saw was a courtroom scene with a panel of jurors, a judge, and witnesses. F. W. H. Adams, former U. S. Attorney, acted as judge. The witnesses were six members of the American clergy. After listening to the arguments, the ASME jury turned in a seven-to-five verdict against internationalization. While each juror was polled the television cameras came up close and members in Boston, Chicago, and Washington were able to get a good look at some of their ASME friends.

Pittsburgh Section Plans 3-Day Meeting in April

THE Pittsburgh Section of the ASME has been at work since late last summer formulating plans and working on a comprehensive program for the combined Pittsburgh ASME Mechanical Engineering Conference and the ASME Process Industries Division Conference to be held April 24-27, 1950.

The program covers such subjects as conditional air for blast furnaces, dust collection, pressure vessels, uses of oxygen in the production of synthetic fuels from coal, methods time measurement, the Lake Erie-Ohio River conveyer, installation, operation, and maintenance of low-cost oxygen plants in the steel industry, metalworking, radiant heating, and spray drying.

Reflecting the interest in and encouragement of the student activities, the young men of the nearby colleges have been invited to read papers at the meeting and get acquainted with the professional engineers.

Arrangements for luncheons and dinner promise the most welcome opportunity for making friends and exchanging ideas. An inspection trip to Beaver Falls, Pa. will include luncheon and a chance to see the Babcock and Wilcox tube mill. An all-day plant trip to the Robena Mine of the Frick Coal and Iron Company is being sponsored by the Pittsburgh chapter of the American Material Handling Society. An alternate trip will be to the Weirton Mine.

Under the energetic leadership of A. M. G. Moody, Elliott Company, Jeannette, Pa., and W. I. Collins, Babcock and Wilcox Company, Pittsburgh, the members of local chapters of other engineering societies have joined forces to make this an engineering event long to be remembered.

Other societies co-operating in the conference will be the Engineering Society of Western Pennsylvania and the Society for Advancement of Management.

The Women's Auxiliary of the Pittsburgh Section, organized last spring, is planning an interesting program for the women.

The bold planning which is going into the conference is a manifestation of energetic leadership and growth of the Pittsburgh Section which increased last year from a membership of 818 to 900.

Section Activities

REPORTS of the following ASME Section Meetings were received recently at headquarters.

Atlanta, Nov. 25. Speaker: R. Benjamin. Subject: Plant Yates and the Georgia Power Company. Attendance: 36.

Baltimore, Nov. 28. Speaker: S. H. Babcock, Jr. Subject: The Wonder Drugs—Penicillin and Aureomycin. Attendance: 81.

Boston, Oct. 27. Speakers: J. J. King and H. U. Wakefield. Subject: Natural Gas for New England. Film: Natural Gas Goes to Markets, product of Tennessee Gas Transmission Company. Attendance: 189.

Nov. 17. Speakers: K. H. Kingdon and D. B. Fish. Subjects: The Engineer Goes to Work, and Science and Engineering in Atomic-Power Development.

Central Iowa, Nov. 17. Speaker: J. J. Feltes. Subject: The Design Engineer—His Effect on Industrial Relations. Attendance: 54.

Central Pennsylvania, Nov. 14. Joint meeting with Bucknell and Penn State student branches. Speaker: Dr. Zerban and Professor Nye. Subject: Steam Generators, illustrated with film. Attendance: 200.

Cincinnati, Nov. 3. Speaker E. M. Estes. Subject: Development of the High-Compression Engine. Attendance: 88.

East Tennessee, Oct. 27. Speaker: L. Z. Dolan. Subject: The Master Plan—Then What? This was a résumé of past, present, and thoughts for future planning of the town area of Oak Ridge, Tenn. Attendance: 48.

Fairfield, Nov. 22. Speaker: A. F. Murray. Subject: Materials Handling and Other Volume-Production Problems. Attendance: 48.

Iowa-Illinois, Nov. 22. Trip through Davenport Works, Aluminum Corporation of America. Attendance: 215.

Kansas City, Nov. 14. Speaker: W. Thomas. Subject: Diesel Locomotives. Attendance: 140.

Ontario, Nov. 10. Speaker: C. L. Brittain. Subject: Mechanical Rubber Goods. Attendance: 50.

Nov. 17. Evening plant trip to Corning Glass Company, Toronto, Can., to observe manufacture of Pyrex dinnerware.

Piedmont-Carolina, Nov. 28. Speaker: F. R. Prosser. Subject: Coal—Its Origin, Mining, and Preparation. Attendance: 45.

Plainfield, Nov. 16. Speaker: F. Ellenburger. Subject: Heat Pumps. Attendance: 68.

Rocky Mountain, Nov. 18. Speaker: G. A. Schauer. Subject: Fairbanks-Morse 2-Cycle Dual-Fuel Diesel Engines. Attendance: 47.

South Texas, Sept. 17. Speaker: H. Vogtborg. Subject: Fuel-Oil Evaluation and High-Speed Mechanisms. Attendance: 70.

Oct. 13. Speaker: D. Allshouse. Subject: History of Scientific Water-Level Control. Attendance: 90.

South Texas (Junior Group) Nov. 16. Speaker: J. Hodges. Subject: Business Economics for Engineers. Attendance: 32.

Upper East Tennessee Subsection, Nov. 18. Speaker: D. R. Shearer. Subject: Electric Radiant Heating. Attendance: 36.

Utah, Nov. 7. Speaker: T. A. Purton. Subject: Power-Expansion Program of the Utah Power and Light Company. Attendance: 30.

Worcester, Nov. 3. Speaker: H. N. Hackett. Subject: Mercury-Unit Power Plants. Attendance: 75.

Dec. 1. Speaker: G. E. Meyers. Subject: Trends in Labor Control. Attendance: 40.

Youngstown, Nov. 10. Speaker: T. B. Henry. Subject: Youngstown's Sewage Problem.

ASME Calendar

of Coming Events

March 30–April 1, 1950
ASME, Region VIII, Annual Meeting, Baker Hotel, Dallas, Texas

April 12–14
ASME Spring Meeting, Hotel Statler, Washington, D. C.
(Final date for submitting papers was Dec. 1, 1949)

April 24–26
ASME Process Industries Division Conference, William Penn Hotel, Pittsburgh, Pa.
(Final date for submitting papers was Dec. 1, 1949)

June 12–16
ASME Oil and Gas Power Division Conference, Lord Baltimore Hotel, Baltimore, Md.
(Final date for submitting papers—Feb. 1, 1950)

June 19–23
ASME Semi-Annual Meeting, Hotel Statler, St. Louis, Mo.
(Final date for submitting papers—Feb. 1, 1950)

June 22–24
ASME Applied Mechanics Division Conference, Purdue University, Lafayette, Ind.
(Final date for submitting papers—Feb. 1, 1950)

Sept. 18–22
ASME Instruments and Regulators Division Conference, Municipal Auditorium, Buffalo, N. Y.
(Final date for submitting papers—May 1, 1950)

Sept. 19–21
ASME Fall Meeting, Hotel Sheraton, Worcester, Mass.
(Final date for submitting papers—May 1, 1950)

Sept. 25–27
Petroleum Mechanical Engineering Conference, Hotel Roosevelt, New Orleans, La.
(Final date for submitting papers—May 1, 1950)

Nov. 26–Dec. 1
ASME Annual Meeting, Hotel Statler, New York, N. Y.
(Final date for submitting papers—Aug. 1, 1950)

(For Meetings of Other Societies see page 98)

Student Branch Activities

REPORTS of the following ASME student branch meetings were received recently at Headquarters:

University of Akron, Oct. 27. Speaker: R. J. Slezak. Subject: Amateur Short-Wave Radio. Film: Lubrication. Attendance: 28.

Nov. 10. Speaker: C. P. Parsons. Subject: The Air-Flow Air Compressor. Attendance: 22.

University of Alabama, Oct. 11. Speaker: Prof. Kuenzel. Subject: ASME, Its Benefits to Student and Junior Members. Attendance: 74.

Alabama Polytechnic Institute, Nov. 7. Film: Steam Power for American Sea Power. Attendance: 90.

University of California, Nov. 1. Speaker: R. H. Green. Subject: Why Automatic Control? Attendance: 38.

Nov. 10. Speakers: Miss Vera Christie, H. V. Wiley, and Prof. Levens. Subject: Employment Opportunities in Engineering. Attendance: 320.

Carnegie Institute of Technology, Nov. 18. Annual ASME smoker. Attendance: 63.

University of Cincinnati, Nov. 18. Speaker: Prof. Wang. Subject: State Professional-Engineering License Examinations. Attendance: 90.

Clarkson College of Technology, Oct. 26. Film: Family Workshop, product of Alcoa Company. Informal discussions by seven faculty members. Attendance: 127.

Nov. 9. Speaker: W. R. Orme. Subject: Application of the Gas Turbojet to Aircraft. Attendance: 176.

University of Colorado, Oct. 12. Speaker: R. F. Chambers. Subject: What Is Your Future? Attendance: 170.

Colorado A and M College, Nov. 2. Speaker: Mr. Barmington. Subject: Processing Sugar. Attendance: 53.

Nov. 16. Business meeting and showing of film on television. Attendance: 75.

Columbia University (Mechanical Division), Nov. 18. Speaker: G. Traczewski. Subject: Education in the USSR. Attendance: 35.

Cooper Union (Day), Nov. 7. Film: The Tacoma Bridge Disaster. Attendance: 42.

University of Delaware, Nov. 7. Business meeting. Program: Prof. Zozzora entertained with magic card tricks. Attendance: 100.

Drexel Institute of Technology, Nov. 2. Speaker: A. Redding. Subject: Jet Engines for Aviation. Attendance: 86.

Duke University, Nov. 8. Speaker: Capt. Nichoson. Subject: Engineering and the World Today. Attendance: 53.

University of Florida, Nov. 4. Film: Steam for Power. Attendance: 64.

Nov. 15. Speaker: G. A. Muller. Subject: Quality Control. Attendance: 49.

George Washington University, Nov. 2. Speaker: L. Goodrich. Subject: Patents From an Engineering Viewpoint. Attendance: 60.

University of Illinois, (Navy Pier Division) Nov. 22. Two films from ASME list. Attendance: 40.

Illinois Institute of Technology, Nov. 10. Speaker: L. Jacobsmeyer. Subject: Controlled Atmospheric Furnace Brazing. Attendance: 100.

Nov. 22. Speaker: Dr. Lillian Gilberth. Subject: You and Your Job. Attendance: 500.

State University of Iowa, Nov. 2. Speaker: H. K. Howell. Subject: Duties and Needs of Graduate Engineers. Attendance: 108.

Nov. 9. General business meeting. Speaker: J. Bingham. Film: The Earth, Its People. Attendance: 107.

Nov. 16. Speaker: W. R. George. Subject: Traveling in Europe, illustrated with movies. Attendance: 102.

Johns Hopkins University, Nov. 19. Tour of the Spring Garden gas plant and discussion. Subject: Processes of Gas Manufacturing. Attendance: 28.

Nov. 21. Speaker: Dr. Hoppmann. Subject: Technical Literature. Attendance: 32.

University of Kansas, Oct. 27. Speaker: H. Atwater. Subject: Oil Combustion and Heating. Attendance: 80.

Kansas State College, Nov. 3. Smoker. Speaker: E. B. Thorn. Attendance: 292.

University of Kentucky, Nov. 3. Pi Tau Sigma tapping exercises. Attendance: 283.

Nov. 17. General business meeting. Attendance: 275.

Lafayette College, Nov. 10. Speaker: F. C. Shulze. Subject: Quality Control in Spring Manufacture. Attendance: 130.

Lehigh University, Nov. 3. Speakers: L. A. Lane and E. L. Morrison. Subject: Southwark Station Boiler Air-Flow Model Tests and Operation Results, illustrated with motion pictures and slides. Attendance: 57.

Louisiana Polytechnic Institute, Nov. 1. General business meeting. Attendance: 39.

Nov. 15. General business meeting. Attendence: 45.

University of Louisville, Nov. 17. Film on Diesel engines. Attendance: 110.

University of Maine, Oct. 19. Business meeting. Attendance: 30.

Nov. 2. Speaker: F. Holden. Subject: Physical Metallurgy. Attendance: 31.

Massachusetts Institute of Technology, Nov. 21. Speaker: W. Stelzner. Subject: Gas Turbines and Jet Propulsion. Attendance: 260.

University of Michigan, Nov. 2-3. Field trip to the Goodyear plant, Jackson, Mich. Attendance: 75.

Michigan College of Mining and Technology, Nov. 8. Speaker: D. E. McFarland. Subject: Professional Adjustments, Psychological Line. Attendance: 62.

Nov. 22. Speaker: Prof. Young. Attendance: 30.

Michigan State College, Nov. 9. Film: Rail Steel. Attendance: 104.

Nov. 30. Film by Dow Chemical Company on Magnesium. Attendance: 75.

University of Minnesota, Nov. 9. General business meeting. Film on Baltimore and Ohio Railroad. Attendance: 40.

University of Missouri, Nov. 14. Speaker: Mr. Martin. Subject: The Mechanical Engineer in the Soap Industry. Attendance: 77.

University of Nebraska, Oct. 26. Speaker: Prof. Smith. Subject: Tractor Testing. Attendance: 77.

Nov. 9. Speaker: Prof. Ludwickson. Subject: Senior Inspection-Trip. Attendance: 76.

Nov. 16. Speaker: Mr. Pugh. Subject: Business and Electronic-Control Equipment. Attendance: 60.

University of Nevada, Oct. 5. Speakers: Prof. Van Dyke and Dr. Harris. Subject: Advantages of Student and National Membership in the ASME. Film shown of the Nevada-Portland game. Attendance: 28.

Oct. 27. Film: Fast-Action (High-Speed) Photography of Industrial Processes, product of the Graybar Electric Company. Attendance: 14.

University of New Hampshire, Nov. 14. Film: Alloy Steels, product of the Bethlehem Steel Company. Attendance: 76.

Nov. 21. Business meeting. Attendance: 82.

Nov. 28. Open meeting at Student Union. Film by Commander Dawley of his expedition to the Antarctic with Admiral Byrd, to conduct an aerial-geographic survey. Attendance: 250.

University of New Mexico, Nov. 16. Speaker: Student J. J. Miller. Subject: Scraping and Smelting Surplus Planes by WAA. Two films shown. Attendance: 26.

New Mexico College of A and M Arts, Nov. 17. Speaker: H. L. Gephart. Subject: Supersonic Wind-Tunnel Testing. Attendance: 48.

College of the City of New York, Nov. 3. Speakers: Prof. Bishop and Mr. Martus. Subjects: Trend of the Technology School Registration, and Principles of the Heat Pump. Attendance: 160.

Nov. 17. Speaker: Miss Frances Weeden. Subject: Gas Turbines. Attendance: 150.

North Dakota Agricultural College, Nov. 22. Speaker: Mr. Sanderson. Subject: Weather Observation. Attendance: 28.

Ohio State University, Nov. 4. Inspection trip through the plant of Timken Roller Bearing Company, Columbus, Ohio. Attendance: 83.

Nov. 16. Speaker: R. A. Kline. Subject: Selection of Industrial Personnel. Attendance: 45.

University of Oklahoma, Sept. 21. Organizational meeting. Attendance: 73.

Oct. 19. Business meeting. Attendance: 15.

Nov. 9. Speaker: D. Cupit. Subject: Fuels Testing. Attendance: 112.

University of Pennsylvania, Nov. 10. Speaker: J. J. Donnelly. Subject: High-Speed Photography. Attendance: 38.

Pennsylvania State College, Nov. 10. Speakers: Prof. Gjesdahl and Mr. Anthony. Subject: Design in Manufacturing. Films: Quality in the Making, and The Story of Wrought Iron. Attendance: 110.

University of Pittsburgh, Nov. 3. Speaker: Dr. Elmer. Subject: How Many Rooms in Your House? Attendance: 159.

Nov. 17. Speaker: Prof. Buck. Subject: Hints and Ideas for Job-Hunting Seniors. Attendance: 159.

Polytechnic Institute of Brooklyn (Day), Nov. 15. Speaker: M. M. Botnick. Subject: Mobile Cranes in Industry. Attendance: 105.

Pratt Institute, Nov. 9. Speaker: F. Wodtke. Subject: Design as a Career in Industry for College Graduates. Attendance: 40.

Nov. 11. General business meeting. Attendance: 44.

Nov. 18. General business meeting. Attendance: 30.

Queen's University, Nov. 4. Films: Air-Foil Design and Bailey Bridges. Attendance: 27.

Rensselaer Polytechnic Institute, Oct. 6. Film: Steam Progress. Attendance: 65.

Oct. 20. Speaker: R. G. Lozier. Subject: Engineering Properties of Rubber. Attendance: 39.

Nov. 10. Speaker: G. Patterson. Subject: Heating at RPI. Visit through the RPI boilerhouse. Attendance: 65.

Rice Institute, Nov. 1. Speaker: J. Mason. Subject: Steam Progress and Boiler Construction. Attendance: 49.

Nov. 15. Speaker: B. Crone. Subject: Air Conditioning. Attendance: 33.

University of Rochester, Nov. 3. Speaker: H. Jones. Subject: What Industry Expects of a College Graduate. Attendance: 49.

Dec. 1. Business meeting. Attendance: 30.

Rutgers University, Nov. 3. Film: Hydraulic Debarking. Attendance: 35.

University of South Carolina, Nov. 15. Business meeting. Film: Lubrication. Attendance: 60.

Nov. 29. General business meeting. Speaker: J. Sallman. Subject: Steam-Driven Vehicles. Attendance: 49.

South Dakota State College, Nov. 3. General business meeting. Film shown on the claiming of magnesium from sea water. Attendance: 34.

University of Southern California, Nov. 10. Speaker: R. S. Ogg. Subject: Mechanical Engineering in the Diesel Industry. Attendance: 40.

Stanford University, Nov. 9. Film: This Is Oil, product of Shell Oil Company. Attendance: 28.

Swarthmore College, Nov. 8. Business meeting. Attendance: 15.

University of Tennessee, Nov. 9. Speaker: Dr. Curtis. Subject: Atoms. Attendance: 33.

Texas A and M College, Nov. 1. Business meeting. Film on natural resources of Texas. Attendance: 49.

Tufts College, Nov. 15. Speaker: E. M. Phillips. Subject: Machine Design. Attendance: 57.

U. S. Naval Academy, Midshipman School, Oct. 19. Film: Principal Types of Jet Aircraft Engines. Attendance: 250.

Oct. 26. Speaker: W. T. Piper. Subject: Aircraft as a System of Transportation. Attendance: 150.

Nov. 2. Film: Salvage of the USS *Lafayette*. Attendance: 250.

Nov. 9. Film: Seebees in Normandy. Attendance: 250.

Nov. 16. Speaker: F. R. Caldwell. Subject: Combustion in Moving Air. Attendance: 75.

Nov. 30. Film: Atomic Power. Attendance: 140.

Vanderbilt University, Nov. 2. Speaker: J. Green. Subject: Preparation for joint dance of engineering societies. Attendance: 50.

Nov. 16. Business meeting. Attendance: 25.

University of Virginia, Nov. 18. Speaker: W. T. Basket. Subject: History of Boiler Feed Controls. Attendance: 39.

Virginia Polytechnic Institute, Nov. 1. Program: Film, Steel depicting processing stages from the ore state to the final ingot form. Attendance: 120.

Nov. 15. Speaker: Dr. Focke. Subject: Metallurgy and Manufacture of Metal Chains. Attendance: 135.

State College of Washington, Nov. 3. Business meeting and educational film. Attendance: 30.

Nov. 17. Speaker: Dr. Pearl. Subject: After Graduation. Attendance: 99.

University of Washington, Nov. 16. General business meeting. Attendance: 26.

Wayne University, Nov. 2. Speaker: J. Bidwell. Subject: Dynamically Loaded Bearings. Attendance: 49.

University of Wisconsin, Nov. 8. Speaker: C. A. Vernon. Subject: Future in Sales Engineering. Attendance: 105.

University of Wyoming, Oct. 4. Opening rally. Speaker: Prof. Lindahl. Subject: History and Advantages of ASME. Attendance: 45.

Oct. 18. Policy-making meeting. Attendance: 36.

Nov. 1. Film: The Hidden World. Attendance: 55.

ASME Sections

Coming Meetings

Akron-Canton: January 19. Joint meeting with American Society of Tool Engineers. University Club. Dinner at 6:30 p.m. Meeting at 8 p.m. Subject: The Studebaker Automatic Transmission, by H. E. Churchill.

Arizona: January 21. Section meeting at Phoenix. Subject: Mining. Speaker to be announced.

Chicago: January 10. Illinois Institute of Technology, Student Union Building at 6 p.m. Annual President's Night with senior students from Illinois Technical and Northwestern specifically invited. Awards will be given to outstanding senior from each school and gold-cards will be awarded to some ASME members. Speaker will be James D. Cunningham, president, ASME.

January 17. Section Meeting. 7th floor Auditorium, 84 East Randolph Street at 7:30 p.m. Subject: Why Product Design? by R. D. Tyler.

Detroit: January 18. Rackham Memorial Building. Combined meeting with Engineering Society of Detroit.

Erie: January 11. General Electric Community Center at 8 p.m. A talk on the Problem of Energy by E. E. Ayres.

Iowa-Illinois: January 24. Juics Danish Farm, Moline, Illinois at 6:30 p.m. Subject: Conveying in the Steel Industry, by F. W. Lovett. Lecture will be illustrated by a sound and color movie.

Kansas City: January 9. University Club at 8 p.m. Subject: Use of Radioactive Isotopes in Industry, by J. Brewer.

Metropolitan Section: January 5. Engineers' Forum, Room 1101[1] at 7:30 p.m. Subject: How To Put Over A Technical Paper, by L. N. Rowley, Jr.

January 11. Power Division, Room 501[1] at 7:30 p.m. Subject: The Sunbury Story, by G. M. Keenan, M. D. Engle, and S. C. Townsend.

January 12. Woman's Auxiliary. Engineering Woman's Club, 2 Fifth Avenue at 12:30 p.m. Installation of officers and luncheon. Subject: Why Are Your Appliances Safe? by Mildred Sommer.

January 17. New Jersey Division, Essex House, Newark, N. J. Dinner at 6:30 p.m. Subject: The Gas-Turbine Power Plant, by J. T. Rettaliata.

January 18. Photographic Division, Room 1101[1] at 7:30 p.m. Subject: The Polaroid Land Camera, by J. Kopelson.

January 20. Machine Design Division, Room 502[1] at 7:30 p.m. Student Presentation Night. Papers and discussion by student branch members.

January 24. Engineers' Forum, Room 502[1] at 7:30 p.m. General interest meeting. Subject: Creating America's New Look With Modern Expressways, by W. S. Chapin and Aymar Embury, 2nd.

January 26. IIRD, Room 1101[1] at 7:30 p.m. Subject: Gyrocompasses. Speaker from Sperry Gyroscope Company Marine Schools.

Plainfield: January 18. Elks Club, Elizabeth, N. J., at 8:15 p.m. Subject: Powder Metallurgy and Its Applications, by J. F. Sachse.

Southern California: January 4. California Institute of Technology, Mechanical Engineering Building, Pasadena at 7:30 p.m. Subject: Plug Valves, by A. A. Fomilyant.

January 11. California Institute of Technology, Mechanical Engineering Building, Pasadena at 7:30 p.m. Subject: Manufacturing of Pipe, by R. Skinner.

January 18. California Institute of Technology, Mechanical Engineering Building, Pasadena at 7:30 p.m. Subject: Writing of Engineering Specifications. 7th class session, by A. Hunter.

Washington, D. C.: January 12. Section meeting. Subject: Synthetic-Fuels Progress, by Dr. Schroder. In addition, this meeting will honor the thirty past-presidents of this section.

[1] Engineering Societies Building, New York, N. Y.

Candidates for Membership and Transfer in the ASME

THE application of each of the candidates listed below is to be voted on after Jan. 25, 1950, provided no objection thereto is made before that date, and provided satisfactory replies have been received from the required number of references. Any member who has either comments or objections should write to the secretary of The American Society of Mechanical Engineers immediately.

KEY TO ABBREVIATIONS

R = Re-election; Rt = Reinstatement; Rt & T = Reinstatement and Transfer to Member.

NEW APPLICATIONS

For Member, Associate, or Junior

ALMACK, L. W., Toronto, Ont., Can.
AMIN, NANUBHAI B., Baroda, India
ANDERSON, LOWELL E., Tulsa, Okla.
ANNESS, RUSSELL, Middletown, Ohio
ARENDS, EDWARD H., Hammond, Ind.
BAKER, DONALD R., Blue Springs, Mo.
BALLEW, JULIUS D., Seagraves, Texas
BARKLEY, FRED W., Boston, Mass. (Rt)
BARNES, DANA H., JR., Newton, Mass.
BASILIUS, KENNETH H., Clay Center, Ohio
BAXTER, GERALD R., Whittier, Calif.
BOOKMILLER, WAYNE H., Saugus, Mass.
BRITSCH, DONALD, Akron, Ohio
BUSCH, HARVEY W., Buffalo, N. Y.
BUTLER, R. EVERETT, Detroit, Mich.
CAPELL, JOHN E., New York, N. Y.
CHICUREL, E., Mexico, D. F.
COHEN, SAID, New York, N. Y.
CROCCO, LUIGI, Princeton, N. J.
DAVEY, JOHN T., Toledo, Ohio
DAVIS, DEAN H., Charleston, S. C.
DENLINGER, J. LESTER, Lancaster, Pa.
DESTEPHEN, ALBERT M., Alliance, Ohio
DRECHSLER, FRANK S., Newark, Del.
DRINKA, MARTIN G., Milwaukee, Wis.
ELY, STRODE L., San Francisco, Calif.
EMERSON, JOHN W., Syracuse, N. Y.
ESTES, JOHN C., Beaumont, Texas
EVERSON, A. K., Hohokus, N. J.
FORD, ROBERT J., Albany, N. Y.
GETZ, DELMOND L., Springfield, Ohio
GOLDMAN, T. DIXON, Baltimore, Md.
GOTH, CARL A., Omaha, Neb.
GUNSELMAN, MERVIN D., Erie, Pa.
HANSEN, W. S., Pittsburgh, Pa.
HEINEMAN, RUTH E., Waukon, Wash.
HEMENWAY, E. L., Englewood, N. J.
HINCKLE, DON A., Columbus, Ohio (Rt & T)
HOSFORD, C. B., JR., Mission, Kan.
HOWARD, CARRINO, JR., Alplaus, N. Y.
HOYT, JAMES S., Saint John, N. B.
IVERSON, MAURICE S., Minneapolis, Minn.
JOHNSON, H. JAMES, Grosse Pointe, Mich.
JONES, LYNN W., Redlands, Calif.
JORDAN, C. C., Milwaukee, Wis. (Rt & T)
JUMAWALLA, F. J., Hyderabad, Deccan, India
KAUTZ, GORDON PAUL, Los Angeles, Calif.
KEENAN, JOHN H., E. Orange, N. J.
KESSLER, CHARLES J., JR., Kent, Ohio
KING, ORVILLE D., Phoenix, Arizona (Rt & T)
KNIGHT, LESTER B., Chicago, Ill.
KOENIG, PAUL R., Chicago, Ill.
KOHLER, WARREN H., Denver, Colo.
KORFF, RICHARD CHARLES, Chicago, Ill.
KREISLE, LEONARDT F., Austin, Texas
KUDLICH, DONALD U., Pompton Plains, N. J.
LEA, WILLIAM G., Claymont, Del.
LENNOX, FREDERICK J., Staten Island, N. Y.
LINDAHL, ROBERT A., New York, N. Y.
LLOYD, ELMER JOHN, New Haven, Conn.
MAHONEY, JOHN E., Tulsa, Okla.
McDONALD, G. C., Albuquerque, N. Mex.
McINTOSH, CLAUDE B., Cleveland Heights, Ohio (Rt & T)

McMILLAN, ANDREW, Medina, N. Y.
MEAD, FRANCIS X., Terre Haute, Ind,
MILLER, EDWARD, Newark N. J,
MILLER, WILLIAM E., Towson, Md.
MIZE, GEORGE G., Indianapolis, Ind.
MOORE, JEROME T., Shreveport, La. (Rt & T)
MUENZINGER, FRIEDRICH, Berlin-Grunewald, Hohenzollerndamm, Germany (Rt)
NIVEN, CLEMENT J., Oakland, Calif.
O'DONNELL, THOMAS P., Maumee, Ohio
OLDENBURG, ROBERT A., Chicago, Ill.
O'NEILL, R. R., Los Angeles, Calif.
ORNSTEIN, WILHELM, Newark, N. J.
OVERHOLSER, J. H. O., Los Angeles, Calif.
PASQUINE, ARTHUR RAYMOND, Metuchen, N. J.
PATRONSKY, L. A., Ann Arbor, Mich,
PAUL, RICHARD E., Lynbrook, N. Y.
PECK, WILLIAM J., San Francisco, Calif.
PIKE, CHARLES W., Ashland, Ohio
REESE, HOMER R., Ridley Park, Pa.
REICHEN, WALTER, Danville, Pa.
REYES, AURELIO, York, Pa.
RILEY, LAWRENCE R., Chicago, Ill.
RUGGLES, ROBERT DEAN, Hampton, Va.
RUMMEL, J K., Baltimore, Md.
RUSSELL, JAMES N., Boston, Mass.
SALDANA, NICANOR G., Belleville, Ill.
SIEGEL, MARTIN J., Dayton, Ohio
SILVER, JOHN A., Whitemarsh, Pa.
SIMPSON, ROBERT F., Menlo Park, Calif.
SMITH, CHARLES S., Westfield, N. J.
SMITH, LOUIS D., Detroit, Mich.
SNYDER, GLENN J., Akron, Ohio
STAWICKI, JOHN A., Brooklyn, N. Y. (Rt & T)
STEIN, NORMAN I., Washington, D. C.
STEWART, ERNEST L., Yazoo City, Miss.
STONE, CHARLES E., Central Miranda, Oriente, Cuba
STRAUSS, LOUIS, Reseda, Calif.
STURGIS, J. R., Atlanta, Ga.
TRENNER, KELVIN, Youngstown, Ohio
UMPHREY, D. M., Palo Alto, Calif.
URQUHART, HOMER J., JR., Birmihgham, Ala.
VANDER ELS, D., Teaneck, N. J.
VANDERSLICE, RALPH L., E. Lansing, Mich.
WAHL, FREDERICK B., Bridgeport, Conn.
WEBSTER, RICHARD R., Pittsburgh, Pa.
WEIGEL, MARION J., Baltimore, Md.
WEIN, JOHN F., Indianapolis, Ind.
WEINHEIMER, C. M., Grosse Point Park, Mich.
WENDT, MAX F., Belleville, N. J.
WHIPPLE, JOHN ELIJAH, Rumford, R. I.
WILKINSON, GEORGE E., New York, N. Y.
WOLIN, ROBERT H., New York, N. Y.
WONG, CHUNG MING, Bridgeport, Conn.
WRIGHT, WILLIAM, Hampton, Va, (Rt & T)
YARNALL, D. ROBERT, JR., Philadelphia, Pa.
ZEMAN, JAMES R., Chicago, Ill.
ZORICH, ARNOLD B., Minneapolis, Minn.

CHANGE IN GRADING

Transfers to Member and Associate

ABBEY, HAROLD G., Jamaica, N. Y.
ALBRIGHT, CLAYTON M., JR., Wilmington, Del.
ANGSTADT, J. W., Kenmore, N. Y.
BACHUS, BENSON FLOYD, Westchester, Ill.
BARKER, RICHARD H., Moylan, Pa.
BENDER, R. J., Addis Ababa, Ethiopia
BODINE, ALBERT G., JR., Los Angeles, Calif,
BONINI, JOSEPH D., Leonia, N. J.
BUDDE, ALBERT A., Hampton, Va.
BYRNE, JAMES J., Aberdeen, Md.
COLLAR, CARL, JR., Madison, N. J.
DE LA CRUZ, F., Fair Lawn, N. J.
DINSMORE, JOHN R., Vallejo, Calif.
DORR, HOWARD G., Akron, Ohio
EKSTEN, CARL E., JR, Henrietta, N. Y.
GAYNOR, TOM A., JR, Seattle, Wash.
GERDES, HENRY A., Brighton, Mass.
GIBSON, HAROLD D., W. New Brighton, N. Y.
GOLDSWORTH, ELMER C., Islip, N. Y.
HAZLETT, WILLIAM A., Baltimore, Md.
JEFFERS, FREDERICK J., Baltimore, Md.
KERVEN, DANYAL N., Istanbul, Turkey
KIMMICH, HERMAN S., Bloomfield, N. J.
KOSH, JOSEPH A., Patchogue, N. Y.
MADDOCK, BILL, Orinda, Calif.
METTLER, A. J., JR., Honolulu, T. H.
MEYER, ROBERT M., E. Hartford, Conn.
MURDOCK, THOMAS B., Schenectady, N. Y.
MUSHAM, WILLIAM C., Chicago, Ill.
NEUMANN, ERNEST P., S. Lincoln, Mass.
PALLADINO, NUNZIO JOSEPH, Plainfield, Ill.
PARZICK, VINCENT J., Brookline, Mass.
SARTO, JORMA OLAVI, Walled Lake, Mich.
SERRELL, PETER VAN HORNE, Pasadena, Calif.
SKWAREK, FRANK JOHN, Burlington, Mass.
SMITH, HERMAN E., JR., Oklahoma City, Okla
SWANSON, CARL A., Chicago, Ill.
TUCKER, ROBERT G., Northbrook, Ill.
WEIL, RICHARD L., W. Hartford, Conn.

Transfers from Student Member to Junior.......100

Engineering Societies Personnel Service, Inc.

These items are from information furnished by the Engineering Societies Personnel Service, Inc., in co-operation with the national societies of Civil, Electrical, Mechanical, and Mining and Metallurgical Engineers. This Service is available to all engineers, members or not, and is operated on a nonprofit basis. In applying for positions advertised by the Service, the applicant agrees, if actually placed in a position through the Service as a result of an advertisement, to pay a placement fee in accordance with the rates as listed by the Service. These rates have been established in order to maintain an efficient nonprofit personnel service and are available upon request. This also applies to registrant members whose availability notices appear in these columns. Apply by letter, addressed to the key number indicated, and mail to the New York office. When making application for a position include six cents in stamps for forwarding application to the employer and for returning when necessary. A weekly bulletin of engineering positions open is available at a subscription of $3.50 per quarter or $12 per annum for members, $4.50 per quarter for nonmembers, payable in advance.

New York	Chicago	Detroit	San Francisco
8 West 40th St.	84 East Randolph Street	100 Farnsworth Ave.	57 Post Street

MEN AVAILABLE[1]

MECHANICAL ENGINEER, mechanical and electrical engineering degrees, 25, married. Trained by large refrigeration and air-conditioning corporation, and worked eight months for air-conditioning contractor as project engineer. Prefers East. Me-577.

MECHANICAL ENGINEER, 27, four years' experience design, automatic machinery. Completed engineering curriculum in three years with exceptional record, RPI, 1949. Veteran. Desires product design, development. Prefers combustion engines. Northeast, Midwest. Me-578.

INDUSTRIAL ENGINEER, February, 1950, graduate of Lehigh University. Prefer New York, N. Y., but will travel, or relocate. Me-579.

MECHANICAL ENGINEER, 49, married, product design and development engineer. Twenty-five years' experience in domestic and industrial hydraulic equipment, metalworking, and automatic machinery. Sales engineer, chief engineer. Available Jan. 1, 1950. Prefers West or East Coast. Me-580-499-D-26.

MECHANICAL ENGINEER, 31, BS, 1941, married, veteran. Four years with manufacturer of small-arms ammunition in process and tool engineering; two years equipment engineer; install, maintain, and improve manufacturing equipment. Desires responsible position. Me-581.

INDUSTRIAL ENGINEER, technical education, twenty years' experience, including extensive methods, time, and motion study. Previously employed by steel and manufacturing companies. Presently employed in staff capacity by company engaged in highly diversified machining and fabricating fields. Me-582.

ASSISTANT PROJECT ENGINEER with six years' experience in the mechanical design of petroleum and chemical plants. Can handle heat exchangers, flow calculations, piping, pumps, furnaces, and set up engineering flow sheets. Me-583.

EXECUTIVE ENGINEER, 48, graduate ME, PE. Twenty-five years of unique practical design and precision-manufacturing experience. Competent to direct all production activities, product development, tooling, and plant engineering. Systematic organizer with successful record of reducing cost and increasing productivity. Well versed in all phases of factory management, budgeting, production control, time study and wage incentives, sound labor relations, union contract negotiations. Desires permanent position. Me-584.

CHIEF ENGINEER, 37, BSME, Drexel, 1936.

(*ASME News continued on page 110*)

[1] All men listed hold some form of ASME membership.

SEATLESS MEANS ECONOMY

IN BOILER BLOW-DOWN SERVICE

Because they eliminate the commonest source of trouble and expense in ordinary blow-off valve service, Yarway *Seatless* Blow-Off Valves mean real economy to boiler plant operators. *Yarways have no seat to score, wear, clog and leak.* Lubrication is usually the only maintenance they require.

Yarway introduced the seatless principle with the balanced sliding plunger many years ago . . . has constantly improved and adapted it to meet modern service requirements. Mechanical and metallurgical research in Yarway's own Steam Laboratory anticipates changing conditions . . . keeps Yarway valve design ahead.

There is a Yarway Seatless Blow-Off Valve for every pressure. Iron body for 50 to 200 lbs., steel body for higher pressures.

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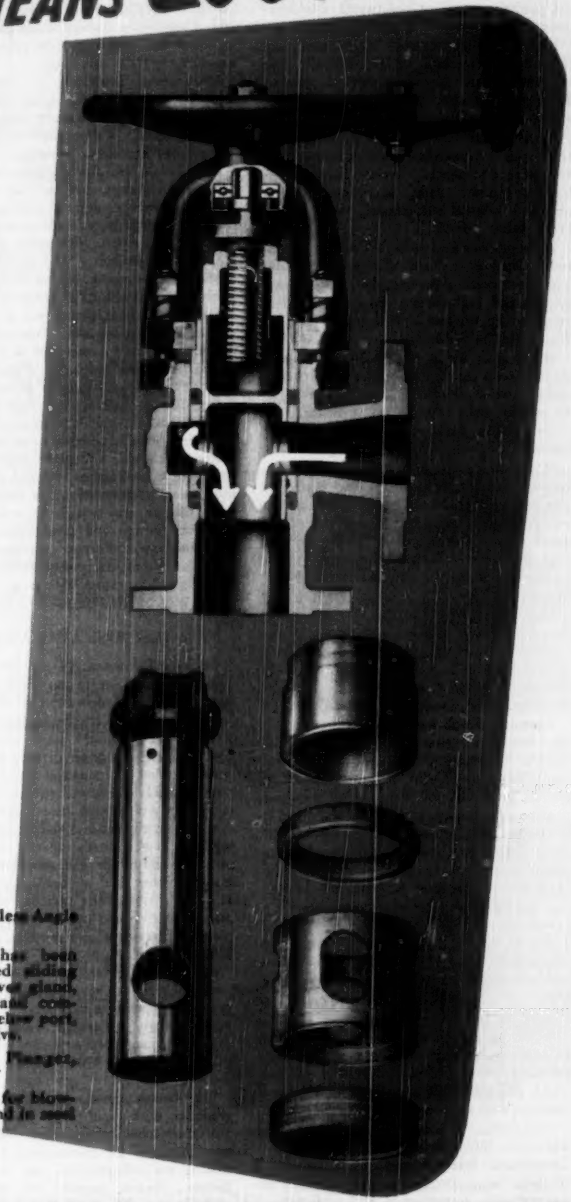


(*Above*)—Cross section of Seatless Angle Valve, flanged.

OPERATION: After valve has been closed, shoulder on balanced sliding plunger contacts upper follower gland, forcing it down into body and compressing packing above and below port, making an absolutely tight valve.

(*Below*)—Balanced Sliding Plunger, Packing Rings and Glands.

Yarway Valve is made in iron for blow-off pressures up to 200 psi., and in steel for pressures to 400 psi.

YARWAY BLOW-OFF VALVES

Thirteen years' experience in sales, design, and manufacturing in medium metalworking industry. Production and cost-minded. Have had patents granted. Good record of achievement. East, South, or Midwest. Me-585.

INDUSTRIAL ENGINEER, mechanical and electrical background, MSIE, BSME. One year's experience cost-control methods, production control, quality control, accounting, and system training. Me-586.

RECENT GRADUATE, B. Aero. E., New York University, 25, married, machine-shop, business-office experience. Desires position airframes, engines, parts, accessories, instruments, or control mechanisms. Any branch except sales. Me-587.

DEVELOPMENT ENGINEER, 24, single, BSME, 1947. One year aeronautical-engineering training. Two years' experience designing cooling systems and high-vacuum equipment used in vacuum-tube research. Will travel. Prefers West. Me-588-61-M.

MECHANICAL ENGINEER, 30, BME. Experienced process equipment, piping design, time study, methods, estimating, technical reports. At present, chief engineer for work for U. S. Army. New York or Southern California. Me-589.

MECHANICAL, INDUSTRIAL-ENGINEERING GRADUATE, Clarkson College, June, 1948, 26, married. Fourteen months of manufacturing and production engineering, supervision, and maintenance of machinery. Desires position with opportunity for advancement in manufacturing or industrial engineering. Will relocate. Me-590.

RECENT GRADUATE, BSME, single. Desires trainee or junior position in design, development, or time study. Seven years' experience as wood patternmaker, three years as army aircraft sheet-metal worker. Prefers metalworking or wood industries. Me-591.

DEVELOPMENT ENGINEER OR ADMINISTRATOR, 44, married, registered, Harvard Business School. Outstanding experience in process and equipment development, instrument and control-design application, sales. Good organizer, inspiring creative efficient teamwork. Me-592.

MECHANICAL ENGINEER, 32, BS, MME, New York PE, eight years' experience, shop planning, testing, research, design, development, awarded several patents, unusual creative talent, seeks greater responsibility and opportunity. Me-593.

MECHANICAL ENGINEER, BME, June 1949. Married, 24, veteran. Majored in both power and industrial options. Experience in production and sales. Will relocate anywhere in United States. Me-594.

MECHANICAL ENGINEER, 25, desires position in engineering office with power or machine company. Four years' experience in machine and power-plant engineering; one year machine shop and foundry experience. Me-595.

MECHANICAL ENGINEER, BSE, University of Michigan, 1948, desires position in small growing concern. General experience in the testing of large naval steam machinery and aircraft gas turbines. Anywhere U. S. A. Me-596.

MECHANICAL ENGINEER, 22, BSME, Carnegie Tech., 1948. Drafting, foundry, and machine-shop practice, quality and inventory control experience. Desires position with future in production or management fields. Locate anywhere. Me-597.

RECENT GRADUATE, 23, single, BSME, University of California. Desires position in field of hydraulics, testing, or design of hydraulic equipment. Will consider any good offer anywhere in U. S. Me-598.

MECHANICAL ENGINEER, 27, MME, 1949, in thermodynamics, PE. Three years' varied experience. Desires trainee or junior position in power work. Will consider teaching with research opportunities. Me-599.

MECHANICAL AND CIVIL CONSULTANT, qualified take care expansion, reconstruction programs, involving equipment, piping, structural steel. Excellent record industrial-plants surveys, making reports, designing, and producing complete projects. Me-560.

METHODS ENGINEER, 28, married, aggressive mechanical and industrial graduate of University of Washington, desires job in production with manufacturing firm. Drafting and estimating experience. Interested in quality control and time and motion. Available Jan. 1, 1950. Prefers Northwest or West. Me-561-4911-D-13.

MECHANICAL AND INDUSTRIAL ENGINEER, seventeen years' experience as plant engineer, master mechanic, and plant superintendent. Complete knowledge of tool and die making, machine shop, automatic screw machines, sheet metal, forging, gray-iron, brass, and aluminum foundries, design and construction projects. Can handle men. Foreign experience in Latin-American mining-equipment installations and buildings. Knowledge of Spanish. Available now. Will travel. Me-562.

POSITIONS AVAILABLE

UTILITIES ENGINEER, 35-40, with BSME degree, majoring in steam and power generation, refrigeration, and operation of these plants. Should be skilled in thermodynamics, heat transfer, etc. Should have several years' combined experience in design, installation, and operation of industrial plant steam and power-generation equipment; and refrigeration equipment and general knowledge of air-conditioning equipment. Will co-ordinate and supervise in an advisory capacity the operation of steam and power-generating plants, refrigeration plants, and air-conditioning systems at all plants. Make periodic visits to all plants, review plans and specifications for new plant, or plant-expansion projects, etc. $6500-$7500. New York, N. Y. Y-2986(b).

EXECUTIVE ASSISTANT, 30-40, mechanical or electrical graduate, who has had a minimum of five years' operating experience with electric public utility. Personnel experience very desirable, as successful applicant will also head this department. $7000-$9000. Southwest. Y-2988.

ENGINEERING SUPERVISOR, 35-50, mechanical graduate, with three to six years' experience with the mechanical equipment of buildings, to take charge of the maintenance of air conditioning and refrigeration, and familiar with boilers, electric motors and wiring, and plumbing, to direct the activities of a plant and other buildings. Oklahoma. Y-3004.

DIVISION SALES MANAGER, 35-42, with engineering background and minimum of five years' industrial sales experience in pumps. Knowledge of the manufacturing and handling of liquids helpful. $6500-$7500. New York, N. Y. Y-3010.

WORKS MANAGER with production experience for assembly, metal stamping, etc. Must have a mechanical degree, preferably with heavy experience. $7500. New York, N. Y. Y-3021.

PRODUCT ENGINEER, 30-40, mechanical or electrical graduate, with design and development experience covering pumps, compressors, motors, and accessories for development of new uses for nonferrous materials. $5000-$6000. Michigan. Y-3053-D.

PROJECT ENGINEER to take complete charge of engineering for a large plant, to test aeronautical engines and turbines. To $10,000 a year. New York, N. Y. Y-3074.

PLANT ENGINEER, 30-45, with at least five to ten years' practical experience in plant maintenance, preferably in process industries. Work will include mixing, refrigeration, electrical, etc. $6000-$7500. New York, N. Y. Y-3075.

DESIGNERS, 40-50, graduate or equivalent, with ten or more years' experience on heavy-machine design such as materials-handling equipment or foundry equipment. Knowledge of stress calculations, familiar with machine shop and foundry methods. $5200. Illinois. R-6052.

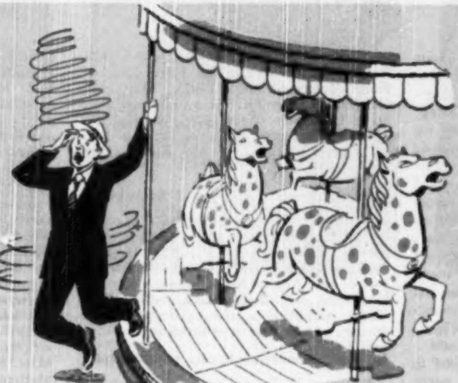
DESIGNER, mechanical engineer informed regarding low-pressure piping, heating, and ventilating, conveyers and other items encountered in coal-preparation plants. Salary open. Illinois. R-6059(c).

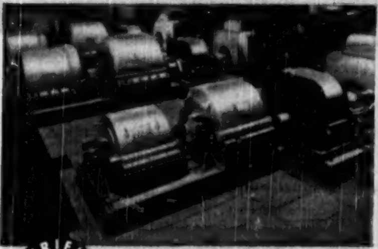
ENGINEERS. (*a*) Management or industrial engineer, 35-45, graduate, with experience in industrial engineering, operating, and costs, perhaps as a factory manager or general-industrial engineer in industry. Previous work should show responsibility for making decisions, directing work of others, and trend toward continuous self-development and growth. $10,000. Illinois. (*c*) Industrial Engineer, 27-32, graduate, with five to six years' experience in manufacturing, including time and motion study, methods improvements, and materials handling. Will supervise four to five people for a multiplant operation involving about 2000 employees in paperboard and folding-box manufacture. About $4800. Southern Ohio. R-6073.

ASSISTANT TO CHIEF ENGINEER, age 35, graduate preferred, with five or more years' experience in design and development on mechanical end of fractional-hp motors, speed reducers, etc. Knowledge of electrical work helpful. Must have previous gear experience, for manufacturer in Chicago. $4420 plus, depending on experience. R-6086.

CONSTRUCTION SUPERINTENDENT, under 45, engineering background, experienced with erection and installation of boilers, industrial furnaces, incinerators, and with installation of refractories; should be informed regarding handling and setting of these installations. Will supervise trades and act as installation superintendent, for construction division of company manufacturing, selling, and installing plastic firebrick, and other refractory specialties. $5200-$6500. Some traveling. Headquarters, Chicago. R-6091.

(*ASME News continued on page 112*)




CENTRIFUGAL


ROTARY

RESEARCH DEVELOPMENT ENGINEER, about 35, mechanical graduate, with ten to twelve years' experience with small equipment, intricate precision machining, and sectionalizing; knowledge of gems and their processing for industrial users helpful; should have basic and fundamental information of high-production processes. Will assist director of applied research in finding competent methods to process gems; requires experimental operation to secure information for design of appropriate machinery. Will assist in these phases and work up reports which are technically sound and correctly presented. Will train for and absorb general over-all aspects leading to successor to director for a manufacturer of jewel bearings. $6000-$8000. Illinois. R-6097.

PROCESS ENGINEERS, strong background in precision machining of very small parts. Must have experience in very close tolerance precision range on small parts using general-purpose machines. Will process, estimate, and request tools for manufacturer of photographic equipment. Salary open. Midwest. R-6100.

METHODS ENGINEER, mechanical graduate, with knowledge and experience in metal stamping, assembly, and finishing; develop improved lower-cost production methods, including assembly fixture design, machine and workplace layout, machine and equipment recommendations, methods simplifications, conveyer layout and installation, preparation of savings estimates and process sheets, for steel office furniture. Salary open. Pennsylvania. R-6117.

Obituaries

Homer Morgan Faust (1899-1949)

HOMER MORGAN FAUST, consulting engineer, New York Coal Sales Co., Columbus, Ohio, died on Sept. 19, 1949, when his car was struck by a locomotive at a grade crossing near Columbus. Born, Youngstown, Ohio, July 7, 1899. Parents, Elias Morgan and Flora (Bossert) Faust. Education, BME, 1923; MSc, 1924, Ohio State University. Robinson Fellow, Ohio State University, 1924-1925. Married Iva May Curry, 1920; children Shirley May and Homer Morgan, Jr. Jun. ASME, 1930; Mem. ASME 1935.

Michael Angelo Perrotta (1903-1949)

MICHAEL A. PERROTTA, mechanical engineer, New York Steam Corp., New York, N. Y., died in New York, N. Y., May 23, 1949. Born, Newport, R. I., Nov. 15, 1903. Parents, Joseph and Angela Maria (Spera) Perrotta. Education, BS, Rhode Island State College, 1927. Jun. ASME, 1939. Survived by his mother, a sister, and three brothers.

Benedict Frederick Raber (1882-1949)

BENEDICT F. RABER, professor emeritus of mechanical engineering and chairman of mechanical-engineering division, University of California, Berkeley, Calif., died at his home in Berkeley of a heart attack on Aug. 15, 1949. Born, Farmington, Iowa, Oct. 8, 1882. Parents, John Charles and Mary (Roth) Raber. Education, ME, Purdue University, 1907. Married Clara Leese, 1922. Mem. ASME, 1914. Served as chairman, ASME San Francisco Section, 1918. Fellow AAAS; Mem. ASEE. Author: Handbook for Heating and Ventilating Engineers (with J. D. Hoffman) 1910; Refrigeration and Air-Conditioning Engineering (with F. W. Hutchinson) 1945; Panel Heating and Cooling Analysis (with F. W. Hutchinson) 1947. Recipient of medal at seventh International Heat Congress in Paris, 1947, for paper "Rational Analysis of Panel Heating and Cooling Systems" (with F. W. Hutchinson). Survived by wife and two brothers.

Frederick Carl Rubloff (1888-1948)

F. CARL RUBLOFF, setup engineer, Bucyrus-Erie Co., sales department, Milwaukee, Wis., died at his home in South Milwaukee, Wis., Feb. 12, 1948. Born, Berlin, Germany, April 15, 1888. Parents, Gustave and Erdme Rubloff. Education, BSME, University of Wisconsin, 1912. Married Eleanor Penner, 1915. Mem. ASME, 1925. Inventor in heavy-excavating field and author of many technical papers. Survived by wife, two sons, Carl P. and Robert; a daughter, Marcia; and three grandchildren.

Georg Schlesinger (1874-1949)

GEORG SCHLESINGER, retired professor of engineering, died Oct. 6, 1949, at his home in Wembley, Middlesex, England. Born, Berlin, Germany, Jan. 17, 1874. Parents, Emanuel and Laura (Wolff) Schlesinger. Education, engineering degree, Charlottenburg Technical University, 1897; doctor dissertation: Fits and Tolerances, 1904. Held patents on machinability tester. Author of many books and articles. Married Elise Schleinger, 1906. Mem. ASME, 1905. Mem. The Institution of Mechanical Engineers; Hon. Mem Institution of Production Engineers. Survived by wife, two sons, Klaus L., Los Angeles, Calif., and Fred, Wembley Park, Middlesex, England; two daughters, Lilli Koenigsberger, Manchester, England, and Mary Korby, San Francisco, Calif., and grandchildren.

Frank Edward Shepard (1865-1948)

FRANK EDWARD SHEPARD, mechanical engineer, Denver Equipment Co., Denver, Colo., died Jan. 1, 1948. Born, Ashland, N. H., Nov. 29, 1865. Parents, Allan Bruce and Martha (Dana) Shepard. Education, ME, Massachusetts Institute of Technology, 1887. Married Rebekah Clark, 1902; children, David Allan, Jean, Richard Crossfield. Jun. ASME, 1889; Mem. ASME, 1902.

Tracy Tuttle, Jr. (1927-1949)

TRACY TUTTLE, JR., tool designer, Massey-Harris Co., Batavia, N. Y., a bullet accidently fired from a high-powered rifle, caused his death on Oct. 2, 1949. Born, Highland Park, Mich., Sept. 28, 1927. Parents, Mr. and Mrs. Tracy Tuttle. Education, BME, Rensselaer Polytechnic Institute, 1949. Jun. ASME, 1949. Survived by parents, a sister, Ila Margaret, and a brother, Harley S.

Noel Urquhart (1907-1949)

NOEL URQUHART, staff engineer, Victor Division, Radio Corp. of America, Camden, N. J., died Oct. 8, 1949, at Cooper Hospital, Camden, N. J. Born, Boston, Mass., Sept. 18, 1907. Parents, Ubert and Charlotte (Root) Urquhart. Education, ME, 1930; MSc, 1932, Stevens Institute of Technology. Married Josephine Kohl, 1929. Mem. ASME, 1945. Survived by wife and daughter, Joelle.

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JENKINS PRACTICAL PIPING LAYOUTS 46

How to plan a

CLOSED FEEDWATER HEATER SYSTEM

The principal application of Closed Feedwater Heaters is in regenerative stage heating of boiler feedwater in steam power plants. They are also used widely in industrial buildings, schools, hotels, hospitals and other institutions to heat the service water.

When used to raise the temperature of boiler feedwater with exhaust steam, bleed steam or live steam as the heating medium, the Feedwater Heater is usually the closed type (as in layout).

Some of the steam passing through a power plant turbine is withdrawn at various stages and goes into its own Feedwater Heater. Here it gives up its latent heat, condenses and passes into a deaerator. From the deaerator, which is at atmospheric pressure, feedwater goes to the boiler feed pumps where the pressure is raised to that of the boiler. It then passes, at about 210°F., through a Closed Feedwater Heater (like the one shown) to be heated to the highest practicable temperature.

Consultation with accredited piping engineers and contractors is recommended when planning any major piping installation.

A CHOICE OF OVER 500 VALVES

To save time, to simplify planning, to get all the advantages of Jenkins specialized valve engineering, select all the valves you need from the Jenkins Catalog. It's your best assurance of *lowest cost in the long run.*

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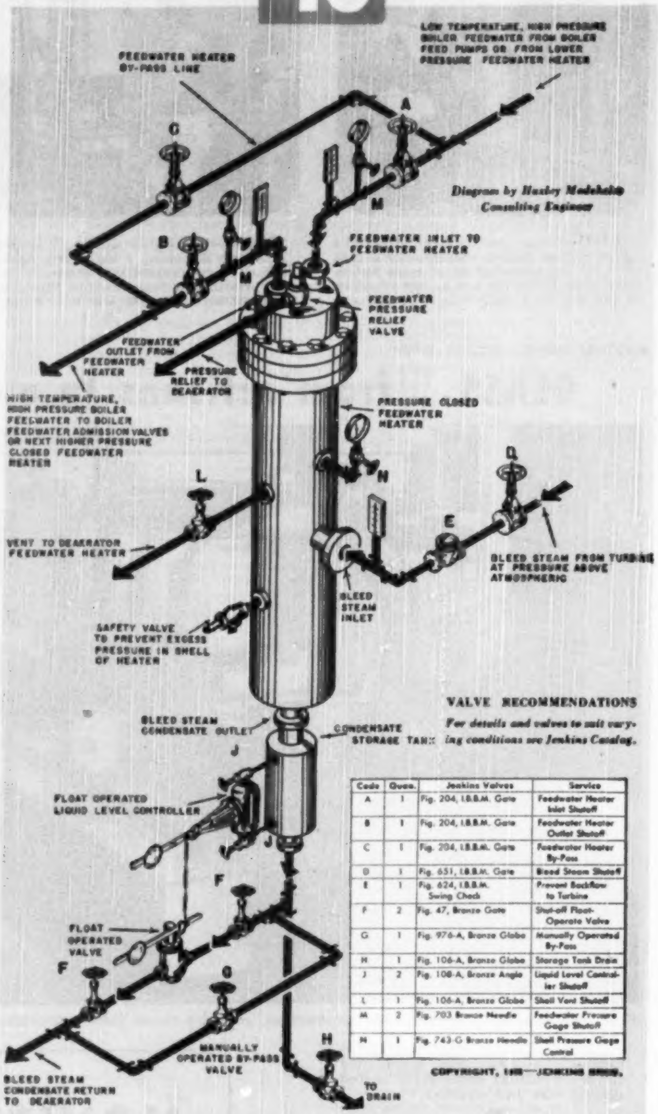

VALVE RECOMMENDATIONS

For details and valves to suit varying conditions see Jenkins Catalog.

Code	Quan.	Jenkins Valves	Service
A	1	Fig. 204, I.B.B.M. Gate	Feedwater Heater Inlet Shutoff
B	1	Fig. 204, I.B.B.M. Gate	Feedwater Heater Outlet Shutoff
C	1	Fig. 204, I.B.B.M. Gate	Feedwater Heater By-Pass
D	1	Fig. 651, I.B.B.M. Gate	Bleed Steam Shutoff
E	1	Fig. 624, I.B.B.M. Swing Check	Prevent Backflow to Turbine
F	2	Fig. 47, Bronze Gate	Shut-off Float-Operate Valve
G	1	Fig. 976-A, Bronze Globe	Manually Operated By-Pass
H	1	Fig. 106-A, Bronze Globe	Storage Tank Drain
J	2	Fig. 108-A, Bronze Angle	Liquid Level Controller Shutoff
L	1	Fig. 106-A, Bronze Globe	Shell Vent Shutoff
M	2	Fig. 703 Bronze Needle	Feedwater Pressure Gage Shutoff
N	1	Fig. 743-G Bronze Needle	Shell Pressure Gage Control

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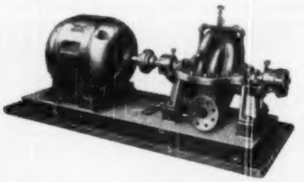
• *NEW EQUIPMENT*

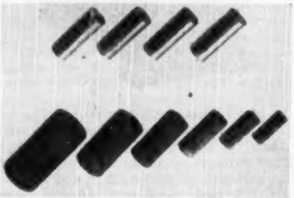
New Warren Two Stage Pump, Type TL

Warren Steam Pump Co., Inc., Warren, Mass., manufacturers of centrifugal and reciprocating pumps exclusively, announce a new two stage pump, Type TL; available in various sizes.



This new line embodies the most modern features of multi-stage design and engineering, including such construction as water cooled, duplex, angular contact ball thrust bearing, labyrinth type seal, heavy, horizontally split casing with flanged bearing supports, inter-stage seal against by-passing, only suction pressure on both stuffing boxes, renewable protective shaft sleeve, and hydraulically balanced, back to back impellers. Capacities to 825 gpm, total head feet to 800. These features assure efficient operation, long life and low maintenance cost. Bulletin 246 illustrates and describes these pumps in detail and is gladly mailed upon request.

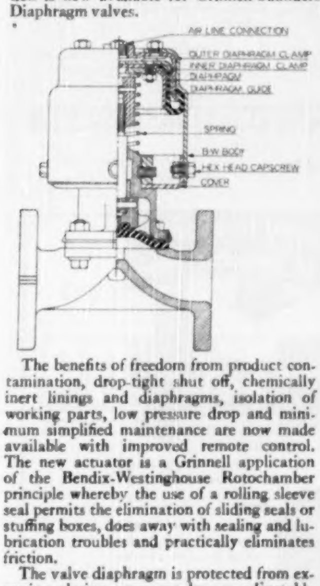
The Screen's The Thing



The heart of a pipeline strainer is its screen. Properly selected, the screen prevents rust, scale and dirt from clogging steam traps, reducing valves or other equipment installed behind the strainer. The screens pictured are used in the Yarway Fine-screen Strainers manufactured by Yarnall-Waring Co., Philadelphia 18, Pa. Top row—screens for screwed-end strainers, sizes $^1/_2$" to 2", are made of Dutch weave Monel wire filter cloth that has small triangular openings which provide fine straining and large free area with mechanical strength greater than ordinary square mesh screens. Ratios of open area of screen to inside area of pipe range from $5^1/_2$ times for $^1/_2$" strainer to $3^1/_4$ times for the 2". Screens in lower row are used in Yarway flanged strainers and are made of perforated brass, Monel or other metal. Perforations may be of various diameters, but the .020" standard for $^1/_2$" strainer and .045" standard for 3" strainers, equivalent to 40 and 16 market grade square mesh respectively, provide area ratios 3 to 1.

Actuator for Diaphragm Valves

A lightweight, compact and leak-proof actuator for pneumatic or hydraulic operation is now available for Grinnell-Saunders Diaphragm valves.



The benefits of freedom from product contamination, drop-tight shut off, chemically inert linings and diaphragms, isolation of working parts, low pressure drop and minimum simplified maintenance are now made available with improved remote control. The new actuator is a Grinnell application of the Bendix-Westinghouse Rotochamber principle whereby the use of a rolling sleeve seal permits the elimination of sliding seals or stuffing boxes, does away with sealing and lubrication troubles and practically eliminates friction.

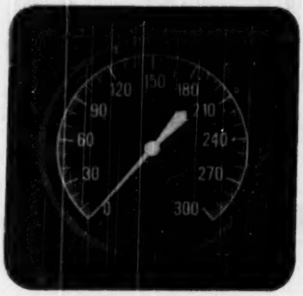
The valve diaphragm is protected from excessive closing pressures by an adjustable positive stop. Long-life and trouble-free operation of the rolling-sleeve seal (tested up to 7,000,000 strokes) are characteristic of the sturdiness of the new actuator.

While pneumatic or hydraulic pressures up to 105 pounds per square inch may be used, usually only 50 pounds of actuating pressure is required to close the valve against one hundred pounds pressure in the line being controlled. Pressure requirements will vary with the type of diaphragm required for the gas, liquid or solution being handled. No filters or regulators are required.

The new actuators are available in any of three combinations: air-to-close; air-to-open; and double acting. There are sizes to handle Grinnell-Saunders Diaphragm valves from $^1/_4$" to 6" as shown in Catalog 4-S which is available on request from Grinnell Co., Inc., Providence 1, R. I.

Illuminated Dial Gages

Helicoid Gage Div. of American Chain & Cable Co., Bridgeport, Conn. has just added to its line a unique illuminated dial gage. The dial is lighted like the new automobile speedometers with black light that glows in the dark.



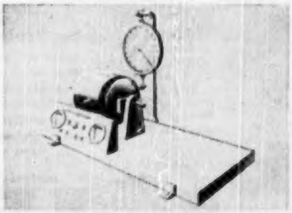
This modern gage is made in a square case for flush mounting on a panel, and is symmetrical with other square case instruments. The dials have a black background with ultraviolet phosphorescent pointer, numerals and graduations, or plain white illumination may be supplied.

It is made in standard $4\text{-}^1/_2$", 6" and $8\text{-}^1/_2$" dial sizes with the same drilling dimensions as conventional round case gages.

This gage, as well as other Helicoid gages has the following features: The Helicoid Movement, which means there are no teeth to wear out; stainless steel bearings, fused joints, Korex steel Bourdon tubes, and the external pointer adjuster.

Fractional-Hp Dynamometer Set for School and Industrial Use

A new fractional-horsepower dynamometer set for industrial and educational use, including college, university, and technical high school levels, has been announced by the Educational Section of General Electric's Apparatus Department.



Having general features comparable to those of larger dynamometers, the new low-priced unit provides an accurate means of

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determining speed-torque curves, fuel or energy consumption, efficiency curves, maximum running torque, etc. In the study of characteristics of both driven and driving machines, the FHP dynamometer set will be a valuable tool in industrial laboratories as well as in engineering and technical schools of both the college and high school levels.

The equipment has a continuous absorption or motoring rating of $^3/_4$ hp at 1725 rpm, and an intermittent absorption rating of $1^1/_2$ hp. Maximum permissible safe speed is 4000 rpm, thus permitting its use with 3600 rpm motors, and with internal combustion engines and other mechanical apparatus. Included in the set is a $9^3/_4$-inch Chatillon dynamometer scale graduated in pounds with 0.1 pound subdivisions. The scale is well damped for easy reading and accuracy.

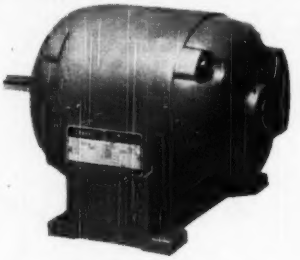
Longitudinal slots, parallel to the shaft of the motor, are located in the base of the equipment so that test motors, generators, or mechanical equipments can be mounted easily.

The dynamometer includes a self-contained control panel with essential instruments, switches, a field rheostat, and screw-base resistance-type loads. Indicating tachometer equipment is an optional accessory.

New Tri-Clad* Single-Phase Capacitor Motor

A new integral-horsepower capacitor motor for use wherever power supply demands single-phase operation has been announced by General Electric's Small and Medium Motor Divisions.

Of cast iron construction, the motor presents a smooth, streamlined appearance. To minimize over-all dimensions, capacitors are mounted in the base of the motor, and there is no conduit box on the side. The conduit box has been replaced by a built-in terminal board inside the end shield for easier wiring.



The new Tri-Clad capacitor motor is compact and lightweight, weighs 15 to 20 per cent less than the old model. It has a totally enclosed built-in starting switch to keep foreign matter from the contacts, and a completely new and tested centrifugal mechanism designed for long, dependable life.

In ratings from $^1/_2$ to 5 hp, these high torque motors are available in two types: Type KCS, capacitor-start, and Type KCR, capacitor-run. According to G-E engineers, these differ only in starting current, not in output characteristics. The Type KCS motor is designed for 115/230 volts, while the Type KCR motor is a single-voltage, 230-volt design.

Dynamically balanced for smoother operation, the motor features the famous Tri-Clad motor triple protection against physical damage, electrical breakdown, and operating wear and tear. Being a capacitor motor, it has no brushes or commutators to interfere with radio or television reception. Also,

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capacitor motors are the only single-phase motors with cast winding squirrel-cage rotors which all industry demands for general purpose motors engineers said.

The motor is equipped with long-life lubricated ball bearings which will run for years without relubrication, but readily accessible grease fittings make possible easy lubrication when it becomes necessary.

* Registered trade-mark.

New Type Pipe Tester

To modernize its municipal laboratory for testing sewer pipe and structural materials, the Borough of Queens, New York City, has acquired a new type testing machine of 200,000 lb. capacity. Inspecting the new machine following installation recently, Queens Borough Works Commissioner M. A. FitzGerald said, "Sewers constructed in Queens must meet rigid standards and this new machine will enable us to continue checking on sewer pipes of large sizes and lengths to make certain that those standards are met." A similar machine of 100,000 lb. capacity was installed earlier in the Brooklyn Borough laboratory.

The Borough of Queens is now using reinforced concrete pipe up to 8 feet in diameter, 8 feet long with 6-in. walls. The new machine is capable of testing pipe up to 9 feet in diameter and 10 feet long between its columns, or even longer by turning the pipe axis and bearing edges perpendicular to the machine. Other structural members of reinforced concrete or other materials can also be tested in compression or transverse bending.

The testing machine is of a new design developed by Baldwin Locomotive Works, Philadelphia 42, Pa. Its principal advantage is the elimination of the conventional deep pit under the machine for operating mechanism, and the resultant economies in installing the machine. All driving mechanism is carried on the crosshead and the rest of the machine is a supporting structural frame of sufficient strength to carry the loads applied to test specimens.

The frame of the machine is approximately 19 feet high and 14 feet wide at the top, on a base 16 x 4 ft. The loading crosshead is supported on two stationary vertical screws 4 in. in diameter. It can be raised and lowered at approximately 12 inches per minute by means of two nuts that are driven through worm gears by a 7-1/2-horsepower motor. The loading beam is equipped with four hooks for attaching chain or cable to specimens. Loads up to 12 tons may be lifted by the loading cylinder.

Compression loads are applied by a reversing hydraulic ram on the crosshead. This ram has a 10-inch stroke and applies load downward at controlled speeds up to 3.5 inches per minute. Return speed is 5 inches per minute. Loads are applied to pipe specimens through an oak timber pad

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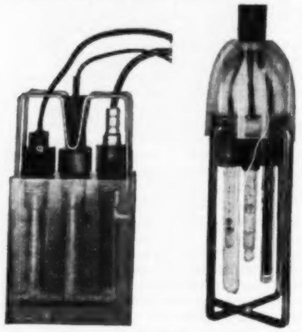
mounted on the bottom of the loading beam and hydraulic ram in such a way as to equalize the applied load when the specimen is centered. The loading beam has a narrow bearing edge for transmitting load to the crown of the pipe. A similar beam with two bearing edges supports the pipe on the base plate for tests.

The load measuring system consists of a hydraulic weighing capsule, entirely independent of the loading system. It is also mounted on the crosshead and is pre-loaded by four springs to keep the system under pressure. This capsule is connected by flexible tubing to the highly accurate Tate-Emery indicator which is standard equipment with Baldwin's finest testing machines. The indicator has a 24-inch diameter dial having 1000 divisions and is masked to provide for three ranges without confusion in reading the scales. Ranges are 0 to 200,000 lb., 0 to 50,000 lb., and 0 to 10,000 lb. The indicator and control cabinet may be placed in any convenient position near the testing machine. Automatic pacing equipment and recording equipment may be used with the machine if desired.

The machine offers new opportunities and advantages in the Queens Borough laboratory. For example, in addition to pipe, large, pre-cast, light-weight, nailable concrete roof slabs are being tested by means of the machine. The fact that one man can operate the new machine instead of four men, as required by an old, hand-operated compression machine, is also an advantage from the standpoint of most effective use of manpower. Furthermore large pipe is readily rolled into the machine and, since tests proceed only to the point of cracking the pipe, it can also be as readily removed. In testing small specimens a table may be used to bring specimens to convenient handling height.

New L & N pH Electrodes Feature Waterproof Design

Two new pH electrode assemblies for use with L&N Recorders and Controllers just announced by Leeds & Northrup Co., 4934 Stenton Avenue, Philadelphia 44, Pa. feature waterproof design. One assembly is for continuous sampling lines; the other for immersion in open channels and tanks.



The sampling line assembly has low capacity which permits a high flow rate and minimizes the coating of electrodes by suspended material. Operating pressure can be up to 15 pounds. Body of the assembly is a single block of clear plastic, $4\text{-}1/4'' \times 1\text{-}3/4'' \times 4\text{-}3/4''$. Inlet and outlet connections fit standard 1/4" pipe.

The immersion unit can be used at a depth of ten feet, or greater with longer lead wires. The assembly consists of a plastic

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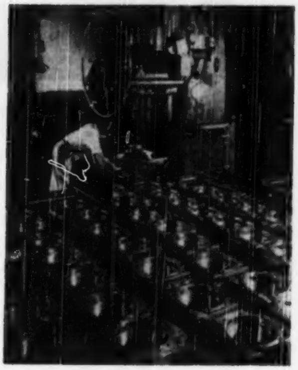
head, measuring elements, supporting pipe (not supplied) and a junction box. The unit is supplied with a steel bar guard. A perforated sheet metal guard is available if desired.

The electrodes and temperature compensating elements are also new. They feature lead wires molded into plastic heads to prevent electrical leakage. All three elements . . . glass electrode, calomel electrode and temperature element . . . screw into place against neoprene gaskets. In case of breakage, replacement is easy.

SKF Develops New Journal Bearings for Union Pacific

An anti-friction journal bearing that substantially increases the riding comfort of railroad passenger cars by cutting down vibration was announced here by SKF Industries, Inc.



The new assembly, described as "knee action on a horizontal plane," was developed as the result of extensive experiments conducted by the Union Pacific railroad. One hundred passenger cars now being built for the U.P. will be equipped with the new units.

Richard H. DeMott, vice president of the ball and roller bearing firm, said the U.P. installation will be one of the largest to be made on a single fleet of high-speed main-line trains since the end of the war. The order calls for 800 journal assemblies in addition to spares.

The new journal bearing allows a greater degree of axle freedom. A predetermined amount of movement—less than an inch on each journal yet more than double that of former applications—lets axles "float" in a lateral direction. Thus vibrations caused by uneven roadbed, cross-overs and curves and normally transmitted to the car body are virtually eliminated.

Each assembly consists of a four-row cylindrical roller bearing and a single row ball thrust bearing. The inner rings of both bearings are clamped on the axle journal which, in turn, is free to move laterally within the outer ring of the rigidly-held roller bearing within the journal box.

The journal bearing units will provide substantial savings in maintenance, the SKF official said, since they use grease instead of oil lubrication, and thus require less frequent inspections.

Of the 100 new cars, the Budd Co. will build 50 of stainless steel, while the Pullman-Standard Car Manufacturing Co. will build 50 with an aluminum superstructure on a steel underframe.

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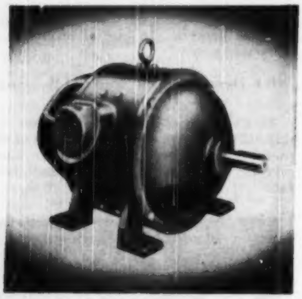
• Keep Informed

New Direct-Current, Life-Line Motors

New Type SK, direct-current Life-Line motors, in one- to 30-horsepower ratings, are available from Westinghouse Electric Corporation. These new d-c Life-Line motors retain the basic design of earlier SK motors, but feature the same all-steel construction used in the a-c Life-Line motors.



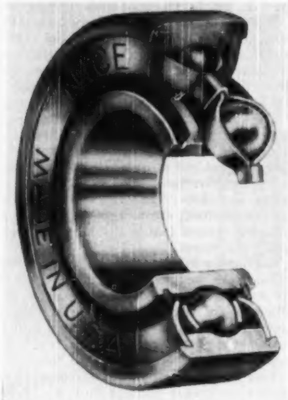
Heavy steel and brackets provide maximum strength, rigidity, and correct bearing alignment.

Pre-lubricated sealed-for-life ball bearings provide effective lubrication without attention. No greasing program is needed for the life of the bearings.

These new one- to 30-horsepower, direct-current motors, in frames 203 to 365, are available for constant, adjustable, or varying speed applications—for either continuous or intermittent service. Depending upon the use intended, SK Life-Line motors can be supplied with shunt compound, or series windings. They are designed for operation from 115, 230, 550, or 660 volts.

For further information write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

New Composition Sealed Bearing Design



The Nice Ball Bearing Co., Philadelphia, Pa., has announced the manufacture of sealed bearings of a new simplified design. Referred to as "composition sealed", the new design involves the use of an oil resistant rubber coated fabric in contact with a specially formed metal shield.

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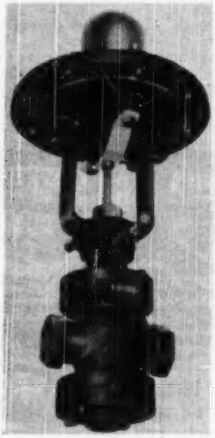
Said to have been exhaustively field tested and proven highly successful, steps have been taken to properly secure all patent rights. The new design is claimed to effectively retain lubricant and exclude foreign material, performance advantages that are necessary requirements for many bearing applications.

Heretofore available metal shielded only, the new composition seal has been applied to Nice 1600 and 3000 series bearings. Series 1600 are "ground all over" precision annular bearings while Series 3000 are inexpensive unground radials of the same "precision type", as illustrated.

Quick Reversibility Features New Stabilflo Control Valve

One of the most revolutionary developments in the design of air-operated control valves makes possible the quick reversibility of action which is the feature of the new Foxboro Stabilflo Valve. In a few minutes' time and without the use of special tools the new valve can be changed from "air to open" to "air to close", or vice versa; and it is not necessary to remove the valve from its installation or to shut down the controlled flow. The new valve is described and the simple reversing operation explained in an illustrated folder (Bulletin 2268) currently published by The Foxboro Co., Foxboro, Mass. Copies will be sent on request.



The new Reversible Motor (for which patent application is now pending) aroused great interest at the Instrument Show, in St. Louis, where it received its first public introduction. With its forged steel motor housing it is similar in general appearance to the conventional Stabilflo Valve. To reverse the action of the valve motor it is only necessary to remove the housing assembly, rotate it one quarter-turn, and replace it. This merely requires the removal and replacing of four bolts, which is easily done with an ordinary wrench.

Quick and easy reversibility is a quality that has long been desired by engineers and operating men in industries of all kinds. The feature of the new Stabilflo Valve means valuable time-saving where changes must be made in existing installations, great convenience in test work or pilot plant operation, and simplification and reduction in the stock of spare valves which the average plant keeps in reserve. The new design is now standard for Foxboro Stabilflo Valves in the most common sizes. *Continued on Page 46*

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G-E X-Ray Thickness Gage Aids Production at Large Eastern Steel Company

A recently installed General Electric 100kv x-ray thickness gage has enabled a large eastern steel company to produce more uniform steel strip than previously was possible.

Installed between a flying shear and the last finishing stand of a 56-in. hot strip mill, the x-ray gage continuously measures the thickness of strip which passes through its throat at speeds approaching 25 miles per hour. Visual indication of the thickness of the strip as it emerges from the last stand is given on an indicator. With this before his eyes, the operator, located on a pulpit adjacent to the gage, adjusts the rolls on the stand so as to keep the strip on gage.

In operation for several months, the new gage has shown very satisfactory results, according to the mill's production department. It has reduced considerably the percentage of off gage material, assuring a maximum of prime stock, and thus has resulted in savings, it was said.

The range of the x-ray thickness gage is 0.040 to 0.190 in., with an accuracy of plus or minus two per cent of the indicator setting. Prior to the rolling of any particular coil, the gage is set for the desired thickness by means of a built-in specimen wedge which can be moved in and out of the x-ray beam.

In being measured, the running strip passes between an x-ray tube located in a steel tank below it and a radiation detector located above it. The strip absorbs some of the x-rays passing between these units; the amount of energy absorbed being an indication of its thickness. Thus, without ever coming in contact with the strip, the gage continuously indicates any deviation from the desired thickness.

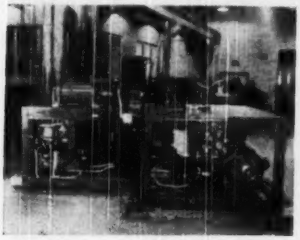
Based on the performance of the G-E instrument, the steel mill operators are contemplating the purchase of a second gage to be installed on another hot strip mill. The device was developed by G.E.'s General Engineering and Consulting Laboratory.

Interchangeable Compact Reducers Adapt New Automatic Power Bender to Different Operating Requirements

A new line of power benders designed to form intricate bends in metal moldings, tubes, frames, etc., at a high production rate features high torque output, all-electric controls and both manual and automatic cycle operation. Manufactured by the Hancock Tool and Die Corp., 17005 Fullerton Ave., Detroit 27, Mich., the first machines are being used in the automobile industry to form garnish and reveal moldings for car and truck windows.

Although all the new Hancock power benders in the line follow the same basic design pattern, variations to meet individual requirements as to operating speed, torque capacity, and size of work to be handled are

provided for in a simple manner. Basic operating components of the machine are a rotary fixture drive and a pressure cylinder arrangement by which the work is bent to the shape of the fixture as the fixture revolves.



Since operating specifications most subject to changing requirements are torque and speed, the fixture drive is composed of a motorized self-contained standard speed reducer, rather than built-in gearing. This makes it possible to alter the speed and torque of the basic machine simply by an interchange of speed-reducers and motors.

Torque requirements for a power bender of this type are of course quite high. The machine shown in the illustration for example, has a torque capacity rating of 44,000 inch lbs. and employs a 15 hp, 1200 rpm motor. To meet these requirements, plus a reserve capacity, and still keep machine design compact, Hancock uses standard Cone-Drive geared reducers.

According to Hancock, the operating requirements are so severe that other speed reducers of equivalent size have failed in these installations. These have been replaced by standard Cone-Drive units. A conventional speed reducer approximately 50% larger would be required to handle the load. This is due to the double-enveloping design of Cone-Drive gearing according to Hancock. The larger number of teeth in continuous contact also provides unusual smoothness of fixture drive, highly desirable in this type of work.

Minor variations in speed—between the various ratios of standard Cone-Drive reducers—are obtained by proper selection of the pulley drive between motor and reducer input shaft. The output shaft of the reducer is coupled directly to the rotating fixture table. The latter is so designed that a wide variety of fixtures can be readily interchanged on the machine.

Incidentally, the Cone-Drive reducers are of the double-extended gear shaft type, permitting use of the reducer to time the machine through a cam plate mounted on the lower end of the output shaft and actuating a series of electrical switches and solenoids to control the air valves to the pressure cylinder, the motor brake, etc. Interchange of cams for different fixtures is thus also made quite simple. The motor brake is located on one end of the motor armature shaft to stop the fixture rotation at specified points in the bending operation.

In operation—which is automatic, either forward or reverse—the operator merely clamps one end of a piece of rolled stock or tubing in the fixture and presses the start button. As the fixture revolves, a shoe is forced against the stock by an air cylinder, forming the strip to the external contour of the fixture. The machine stops automatically and the operator unclamps and removes the finished part. A selector switch also provides manual control, energizing forward

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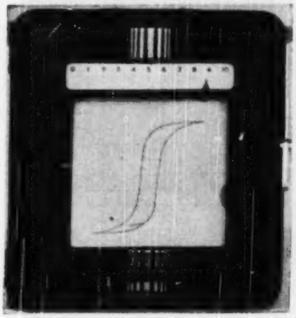
and reverse buttons for "jogging" the machine in test and setup of a new job. An emergency stop button is also provided for both automatic and manual operation.

New L & N Recorder Plots X vs Y Automatically

A new Speedomax Recorder now automatically plots the relationship between two variables, showing one as a function of the other. Tedious compilation and manual plotting by experienced personnel are eliminated. Instead, the variables to be plotted are converted d-c signals, and connected to the instrument, one to the horizontal axis and the other to the vertical axis. The result is a permanent record, accurately plotting in minutes data that would require hours using the usual point by point method.



As compared to the usual recorder, which has only one measuring circuit and a constant speed non-reversing chart paper drive and which plots a variable as a function of time, this new recorder has two measuring circuits. Pen travel (X axis) is controlled by our well known Speedomax G electronic circuit. A similar circuit controls the chart paper drive, (Y axis) and makes it reversible. Thus, the new recorder makes it possible automatically to draw curves such as a hysteresis loop, temperature vs. temperature difference, stress vs. strain or other two variable curves.

Response of the instrument is amply fast. The pen takes only 3 seconds for full scale travel of 9-7/8". Full chart travel is 10" and requires 4 seconds. Standard minimum input voltage for full travel of the X coordinate is 2.5 millivolts, while the Y coordinate requires a minimum of 10 millivolts, for full travel.

For further information, write to Leeds & Northrup Co., 4934 Stenton Avenue, Philadelphia 44, Pa.

New Heavy-Duty Portable Dust Collectors Announced by Kirk & Blum

To fill a long-felt need in industry for a heavy duty portable dust collector, The Kirk & Blum Mfg. Co., Cincinnati, Ohio, announces the new type "M" unit dust collector. Three models are available in 450, 900 and 1800 CFM at high velocity.

These heavy duty collectors can be set up anywhere to serve one or several machines for any period of time . . . or can be readily moved to meet changing needs. They eliminate the need for long, costly pipe runs to remote areas of a plant where one or a few machines are located.

These units are said to be of greater capacity and more efficient than smaller conventional collectors. Each unit is compact, self-contained and ready to operate.

The Type "M" units handle dust from grinding, buffing, and polishing metal-work machines and similar dust sources. Each unit consists of motor, exhauster, centrifugal pre-cleaner and steel wool filter after-cleaner.

In all sizes of the new Type "M" Unit Dust Collectors, the principles of operation are the same. The dust laden air is delivered to a small diameter high efficiency, centrifugal pre-cleaner where all but the finest particles are removed. The air then passes through steel wool filter pads, three inches thick, for final cleaning.

Motor and exhauster are completely isolated from dust. The units are completely fire proof. Housings are extra heavy. Exhausters are heavy dust industrial type, direct connected to a 3600 rpm., 220/440 volt motor. The motor is amply ventilated and readily accessible through a removable expanded metal panel. Dust receptacles are gasketed, sliding drawers, secured with a hand wheel to insure a leakproof seal.

Where conditions will not permit the re-entry of cleaned air into the working area, the filters are replaced with air-tight closures and the air vented to the outside. Exhaust stack connections can be furnished at top or any side of the unit.

Where it is desired to return the cleaned air to the building during the winter months to conserve heat and to vent it to the outside during the summer months to improve ventilation, the unit may be equipped with both exhaust stack and filters. The change is effected by merely turning a damper in the stack.

Maintenance is reduced to a minimum according to the manufacturer. The after-cleaner, readily accessible through an expanded metal, usually requires cleaning not more than once in two weeks, depending on usage.

For detailed information write for Bulletin No. 43M to The Kirk & Blum Mfg. Co., 2894 Spring Grove, Cincinnati 25, Ohio.

Chambersburg Announces New Die Service for Cecostamp Users

The Chambersburg Engineering Co., Chambersburg, Pa. announces the establishment of a new die service for the convenience of Cecostamp users. The Cecostamp is an air operated, impact drop stamp made by Chambersburg and capable of forming a wide variety of shapes from all the formable metals. It is sensitively controlled, having the ability to strike a blow of any degree of intensity required by a particular stamping operation.

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Originally developed for the formation of sheet metal aircraft sections, use of the Cecostamp has been successfully extended to numerous other metal forming operations. Sections of buses, automobiles, small boats, railroad cars, home refrigerators, and agricultural machinery are listed among the many products now being formed with the Cecostamp. Job-lot stamping concerns have found the Cecostamp a most economical tool and jewelry and silverware companies are utilizing it for embossing in sharp relief.

One of the advantages of the Cecostamp, is the fact that dies made of relatively soft metals may be used. These dies are poured instead of being cut from solid metal, and may be re-melted for future use whenever desired. However, convenient sources of these dies have not been heretofore available, except where Cecostamp users put in their own die shops. Now, the development of a zinc alloy die foundry at Chambersburg makes a ready source of these dies available to both prospective and current Cecostamp users.

Manufacture of zinc alloy dies at Chambersburg (either from the customer's sample part or from drawings) will be in accordance with current recognized techniques. The first step is the construction of a plaster pattern made to conform with a finished sample part or drawing. Accurate allowance is made for shrinkage of the zinc alloy in the pattern. From the finished plaster pattern a sand mold is made from which the die is cast.

Dies made of zinc alloy have a reasonably high tensile strength and possess self-lubricating properties, making them ideally suited to short production runs. In addition to being considerably less expensive than hard steel dies, zinc alloy dies are easily machined and have a fine surface making necessary only a minimum of machining.

Zinc alloy dies are particularly recommended for stamping operations where economy is more to be desired than long production runs (as, for example, the stamping of replacement parts for products discontinued in manufacture). Fabricated in days, instead of the weeks required to make hard metal dies, zinc alloy dies effect tremendous savings when frequent design changes or experimentation necessitate new tooling.

The newly established Chambersburg die service places years of experience in the production and application of zinc alloy forming dies at the disposal of every Ceco-

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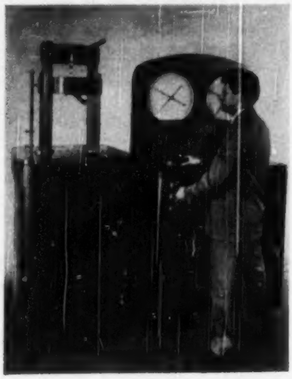
stamp user. It is expected that far greater potentialities for the zinc alloy die than are now realized will develop as industry meets new forming problems.

Chambersburg has retained Robert L. Stubbs, one of the country's leading authorities on Cecostamping techniques, to supervise the new die service, and to advise on Cecostamp installation and operation.

60,000 lb. Testing Machine

Development of an improved, low-cost universal testing machine (Model 60-8) of 60,000 lb. capacity with two ranges is announced by The Baldwin Locomotive Works, Philadelphia 42, Pa., and it is now in production. Designed like larger Baldwin machines with hydraulic loading unit separate from the indicating and control unit, recoil from breaking specimens is isolated and maximum or lazy hands can be adjusted with minimum drag. The two-unit design also permits varying their relative positions to suit any requirement.



Another feature of the new machine is its exceptionally rigid, two-column design which gives high accessibility in handling specimens and simplifies observations. Load (either in tension or compression) is applied by an integrated piston and elevating cage consisting of the table, two uprights and upper gripping head, all of which have a 6 in. stroke. The lower gripping head is the upper member of a second, adjustable cage including two long columns and lower crosshead supported by a vertical screw extending downward from the closed end of the hydraulic cylinder.

High stability is achieved by the distance between column guides and supporting screw in all positions of this cage, which prevents side play. Another important advantage of this arrangement of the machine is the protection afforded by enclosing the adjusting screw.

A motor-drive for positioning the lower gripping head within the loading cage, is also a new feature as standard equipment for this class of machines. The motor-drive, including worm gear and nut on the adjusting screw, is mounted on the lower crosshead, giving a range of 17 in. at 10 in. per min. Push button controls are on the front of the control cabinet.

Loading controls giving infinitely variable speed between 0 and 2 in. per min., are located on the table of the control cabinet. The flow of oil to the cylinder is controlled by a directional control valve for up and

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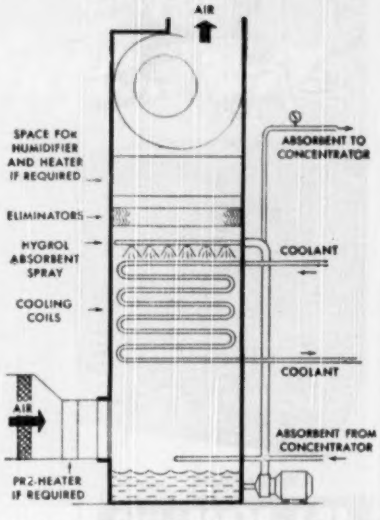
New Method Gives Precise Control in Air Conditioning

Niagara "Controlled Humidity Method" Uses Hygrol, Hygienic Liquid Absorbent

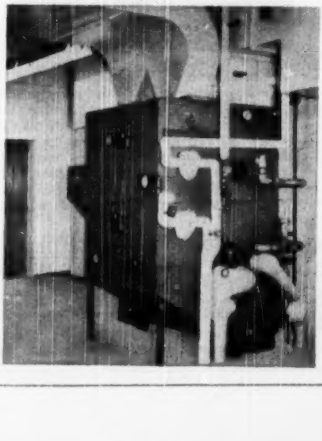


NIAGARA CONTROLLED HUMIDITY METHOD — FLOW DIAGRAM

● The Niagara "Controlled Humidity Method" is a new system of air conditioning giving complete control of temperature and relative humidity, holding constant conditions or varying them at the will of the user. Especially, it provides dry air at normal atmospheric temperatures with little or no refrigeration required. A condition of 15 grains of moisture per pound of air at 85 deg. F. dry bulb temperature has been produced without refrigeration.

The apparatus is enclosed in a casing thru which the air is drawn by fans. The air is filtered and then enters a chamber where it is dehumidified in passing thru a spray of "Hygrol" Liquid (a hygienic hygroscopic chemical that absorbs the air-borne moisture and contains no salts or solids to precipitate). In the same chamber are located cooling coils which remove the latent heat of evaporation and also sensible heat as required.

The absorbent liquid spray falls into a tank at the base, where it is piped to a concentrator, removing moisture taken from the air. The re-concentrated liquid returns to the system. This process is continuous, and the apparatus operates at full capacity at all times.



The same equipment may be used to provide winter air conditioning when required, by installing a tempering coil at the outdoor intake, an humidifier, and a reheat coil above the eliminators.

This equipment is manufactured in a range of sizes providing from 1000 to 20,000 CFM of conditioned air from a single unit, and mutiple unit installations are practical. It is expected that, by reducing the need for refrigeration, the cost of air conditioning will be reduced by this method. Applications generally are in a temperature range from 35 deg. F. upward. Below the freezing temperature of water, the Niagara "No-Frost" method is applicable.

The equipment is protected by U. S. and foreign patents. Installations have been made in food and chemical process industries, in packaging hygroscopic products, for preventing condensation of moisture on metals and other products in storage, in air conditioning for laboratory control and for human comfort.

For further information, write Niagara Blower Company, Dept. ME, 405 Lexington Ave., New York 17, N. Y.

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down motion and two valves, for course and fine control of testing speeds. Automatic safety devices protect gages against overloads and prevent over-travel of moving parts.

Vertical distance between gripping heads may be 1 to 18 in., the latter including the stroke. Clear lateral space between columns is 10 in. The table is arranged for transverse testing and is drilled to secure standard transverse tools at spans of 12, 18 and 24 inches.

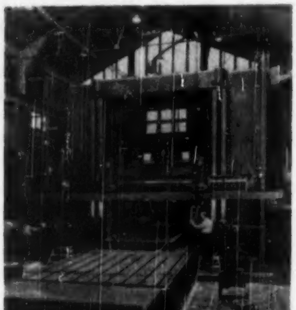
The hydraulic loading cylinder is of the so-called "lapped" construction with oil seal. Oil that escapes through the clearance space is protected against contamination and is returned automatically to the reservoir.

The 60,000 lb. range is graduated in 100 lb. units on a 16 in. diameter indicator dial and a 12,000 lb. range is graduated in 20 lb. units. Bourdon gages for both ranges are precision Emery type, with accuracy within 1% or one dial division, whichever is greater. They are connected directly with the loading cylinder. A standard Baldwin recorder can be used with the machine if desired.

Gigantic Planer and Milling Machine Placed in Operation at General Electric Schenectady Works

A gigantic planer and milling machine which can shave a sliver $^1/_{1000}$ of an inch thick from a steel block the size of a railroad box-car, has been placed in operation at the General Electric Company's Schenectady Works.

Built by the Consolidated Machine Tool Corp., Rochester, N. Y., and powered by G-E motors, the machine will be used in the manufacture of equipment for industrial and power generating applications, such as synchronous condensers, hydraulic turbine-driven generators, and large steel mill motors and generators.



The machine is a 27-foot-high arch with a 40-foot-long table which slides through the archway. Capable of functioning as either a planer or milling machine, it eliminates the task of transferring materials to two machines, when both operations are required. The table will carry loads up to 200 tons, and, because of its size, will permit several parts to be bolted together and handled as a single unit.

The machine is set in a foundation which required 30,000 pounds of steel and enough concrete to lay a sidewalk more than two and one-half miles, G-E engineers said.

Regulated from two pendent push-button stations, the machine is completely controlled by electronic equipment. The stations, one for each operation, hang from the

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top of the arch. They can be easily carried to different locations, enabling the operator to control the machine with a minimum of difficulty.

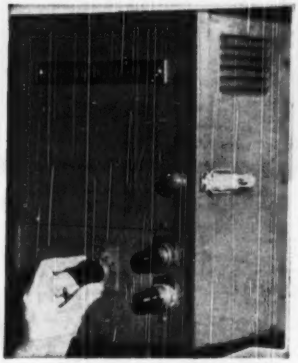
An emergency lever, which responds to a slight touch of a finger, protrudes from the bottom of the pendent station and will stop the machine instantly when touched, according to the engineers.

A single switch converts the machine to either the planing or milling operation. When performing as a planer, a 100-hp motors moves the table at speeds ranging from 10- to 150-feet per minute.

During the milling operation, the table travels from 3- to 45-inches a minute, while two 50-hp motors operate the cutters. Maximum length of material which can be milled is 30 feet.

Westinghouse Announces Mot-O-Trol Packaged Adjustable Speed Drive

Westinghouse announces Mot-O-Trol packaged adjustable speed drive, employing electronic precision to provide a wide, stepless range of speed control for d-c motors from a-c sources. It starts motors, brings them up to a pre-set speed smoothly and rapidly, permits change of speed at any time, applies dynamic braking for stopping, and reverses motors.



A feature of the Mot-O-Trol drive is the sub-assembly construction of the unit. Complete sub-assemblies can be removed for easy maintenance.

A single dial gives finger-tip control of the motor throughout its entire speed range. Speed may be pre-set before the motor is started, or it may be changed after the motor has come up to speed. Once speed is set, Mot-O-Trol drive automatically maintains close speed regulation to full speed.

Improved IR drop compensation provides a nearly flat speed-torque characteristic over the entire speed range of the drive. This compensating circuit is controlled by feedback from the armature current.

For further information write Westinghouse Electric Corp., Box 868, Pittsburgh 30, Pa.

Westinghouse to Build Big Motor for Finnish Paper Mill

A 1,250-horsepower, direct-current motor —one of the largest ever designed for a paper-forming machine—will be built by Westinghouse Electric Corp. at East Pittsburgh, Pa., for delivery to the Enso-Gutzeit paper mill in Finland, it was announced recently by R. H. Harris, sales manager, Westinghouse Electric International Co., New York, N. Y.

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The big motor will provide all the driving power necessary for the various sections of the block-long, paper-forming machine by driving a lineshaft extending the length of the machine. Power is transmitted from this shaft to the various sections of the machine by belt and gear arrangements.

The Enso-Gutzeit machine is capable of producing a continuous web of paper 192 inches wide at a speed of 1,500 feet per minute.

The electrical equipment to be supplied by Westinghouse and built at East Pittsburgh will include a 1,000 kilowatt synchronous motor-generator set for supplying power to the 1,250 horsepower motor, complete control including a Rototrol rotating type of paper machine speed regulator, and other auxiliary equipment such as 250 horsepower "winder" drive. The "winder" re-winds the paper from the giant reels produced on the forming machine into smaller, more easily handled rolls.

The order, valued at $143,000, was negotiated through the Westinghouse Electric International Co.

Improved Baldwin-Rex Chain Vises

The Baldwin-Duckworth Div. of Chain Belt Co. of Milwaukee, announces the improved Baldwin-Rex Chain Vises. These improved chain vises now have hardened jaws for greater strength, durability and longer life.

Baldwin-Rex Chain Vises simplify the job of taking roller chain apart. Single or double width chain can be securely clamped in the vise while an ordinary drift is used to drive out the pin or rivet. The jaws are so shaped that the pin link has a firm seating on the edges of the jaw.

For further information on Baldwin-Rex Chain Vises, write Chain Belt Co., Milwaukee 4, Wisconsin.

• LATEST CATALOGS

New Type Refrigeration Charging Hose

An illustrated bulletin describing "Refrigerant Service Hose", a charging hose of new type construction, has just been released by Chicago Metal Hose Corp., Maywood, Ill. This hose utilizes a neoprene packed corrugated steel core for gas-tight strength and flexibility. This core is enclosed in a thick neoprene casing, which is in turn covered with a protective braid of glased cotton. The bulletin showing construction in detail and other data is available upon request to those showing their company affiliation and title or function.

Centrifugal Fire Pumps

Two basic types of Underwriter's approved centrifugal fire pumps, together with selection charts, necessary fittings and application data are described and illustrated in a new Bulletin available from the Peerless Pump Div. of the Food Machinery & Chemical Corp.

Both single stage and two-stage fire pumps and their methods of drive and application are comprehensively covered, both in illustration and text in this Bulletin. In addition, dimension drawings and dimensional data are set forth on both types of pumps. Selection charts cover capacity, heads, horsepower range, rpm of each pump for each type of drive, which can be electric motor, diesel gasoline engine or steam turbine.

Four of the Bulletin's pages are used to describe necessary fittings for all approved

fire pump installations, with detailed text on hose valve heads, blind flanges, overflow cones, eccentric suction reducers, concentric discharge increasers, relief valves, etc. Tank filling and jockey pumps for use in connection with automatic sprinkling systems are also described and illustrated.

The Bulletin shows installation of the various types of pumps and drives. One of these installations is an unusual foam system employed by the Hercules Powder Co. for protection against fire in solvent process buildings in its naval stores plant at Brunswick, Georgia. The Hercules method and the necessary pumping equipment for obtaining its protection is shown in detail.

Copies of this Bulletin, designated as Bulletin B-1500 may be obtained by writing the manufacturer, Peerless Pump Div., Food Machinery & Chemical Corp., 301 West Avenue 26, Los Angeles 31, Calif.

General Electric Announces New Switching Locomotive Bulletin

A new, 16-page bulletin, describing the 80-ton diesel-electric locomotive for industrial switching has just been announced by General Electric.

The bulletin describes the locomotive completely and shows why it is economical to operate. Fully illustrated, the bulletin points out salient features of the unit.

The publication is available to readers of this magazine by writing Apparatus Dept., General Electric Co., Schenectady 5, N. Y. and asking for Bulletin GEA-3810A, "80-Ton Diesel-electric for Industrial Switching".

The Working of Tool and High Speed Steels

Technical data certified by the Metallurgical staff of Allegheny Ludlum Steel Corp. have just been published and are now available in a 16-page booklet titled "The Working of Tool and High Speed Steels."

Called a "Blue Sheet," the booklet gives specific information summarized from carefully checked laboratory and service tests on various grades in the A-L line. The booklet begins with a simple selector chart and then tersely gives procedures and tabulations that form a working manual for makers and users of cutting tools and dies. Typical heads are: design, machining, cutting-tool angles, speeds, heat treatment, grinding.

This new publication is designed for use in conjunction with the other Blue Sheets in the series which give in detail the properties of each type of tool and high speed steel.

Westinghouse Booklet Tells How to Select Freight Elevator

How to integrate the selection of freight elevators with the material handling problem is but one of many questions answered in the 44-page Buyer's Guide booklet on Freight Elevators recently published by the Elevator Division of Westinghouse Electric Corp.

There are ten profusely illustrated sections in the booklet that explain the basic considerations involved when selecting freight elevators and component parts of freight elevators. These include: how to determine the lifting capacity and size; types of elevator control systems; how to determine the method of door operation; layouts for standard freight elevators; how to determine the type of elevator best suited to your needs; budget price information; and, typical and special installations.

The sections on determining the right elevator, on layout, and on applying freight elevators use the case example method to describe the procedural steps. As a result the problem is reduced to basic considerations.

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A freight elevator application curve will be found to be a definite time saver.

For a copy of Booklet B-4402, write E. B. Dawson, Elevator Division, Westinghouse Electric Corp., Jersey City, N. J. on Company letterhead stationery.

American Pulverizer Co. Announces New Bulletin

"For Better Testing and Small Scale Reduction" is the title of a colorful six-page bulletin prepared by the American Pulverizer Co. of St. Louis. It describes in detail the many practical applications of the company's American Laboratory Crushers, Grinders and Shredders for the reduction of coal, by-products, chemicals, clays and many other products in testing laboratories and universities. Typical installations are clearly diagrammed and explained. Special attention is devoted to construction features and functional advantages of the different mills as applied to different reduction jobs. This information bulletin may be obtained immediately by writing American Pulverizer Co., 1250 Macklind Ave., St. Louis 10, Mo.

Edward Issues New Instrument Valve Bulletin

A new Edward bulletin, No. 491, providing information on new drop forged steel Edward Instrument valves for meter, gage, instrument, and other small lines, has been issued by Edward Valves, Inc., East Chicago, Ind. These new valves have a rating of 6000 lb WOG at 100 F or 1500 lb sp at 850 F with carbon steel bodies and 1500 lb sp at 1000 F with stainless steel bodies. Bulletin 491 contains dimensions, weights, prices, and operating data.

Heat Loss Data Bulletin For Direct Fired Industrial Heating Offered by Thermobloc

A bulletin just published by the "Thermobloc Division" of Prat-Daniel Corporation provides data tables for computing heat loss and figuring heat requirement that are useful to the maintenance or heating engineer whose job it is to figure heat loads and fuel consumption. Tables on outdoor design temperatures, common types of industrial construction, heat losses through window and door infiltration and a table on heating constants.

The bulletin contains complete catalog descriptions of "Thermobloc" Self-Contained Direct Fired Industrial Heating Units of 300,000 and 550,000 Btu per hour output capacity.

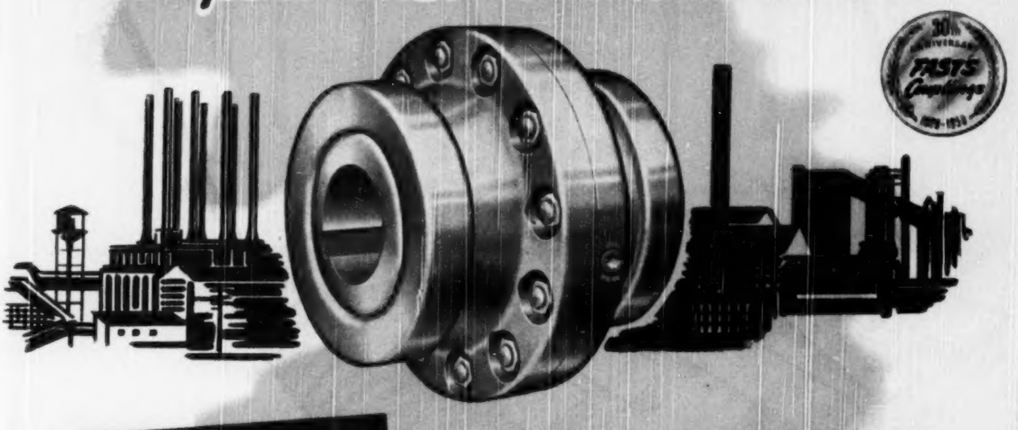
Also available from the manufacturer are a series of data sheets showing how Direct Fired Heaters can be used for tempering make-up air, process heating, and other special applications to which the "Thermobloc" is adaptable.

Copies of this helpful bulletin and the data sheet series are available from the "Thermobloc Division" of Prat-Daniel Corp., East Port Chester, Conn. Request Data file 901.

Spring Tester

A new 4-page illustrated bulletin No. 302, has been prepared to describe and illustrate the Baldwin-Hunter spring tester and its applications. This instrument, newly available from Baldwin Locomotive Works, is applicable to any type of small springs for loads up to 5 pounds and length up to 12 inches at specified load. The bulletin explains the value of this precision instrument, shows its design features, set-up and operation for production testing, and illustrates its use in various ways. Specifications are also given. Copies are available from The Baldwin Locomotive Works, Testing Equipment Department, Philadelphia 42, Pa.

NOW- you can FORGET COUPLING SHUTDOWNS—



INDUSTRY REPORTS— **KOPPERS ENGINEERING STOPS COSTLY FAILURES**

These FAST'S COUPLING *Services save you money!*

UNSURPASSED ENGINEERING . . . *Koppers Engineers are acknowledged the best in the coupling industry. Their practical knowledge, backed by 30 years of coupling experience, is at your service!*

IMMEDIATE DELIVERY . . . *All standard types and sizes are available for immediate delivery from "on hand" stocks. In case of emergency, just wire factory for special rush delivery!*

LOWEST COST PER YEAR . . . *Fast's Couplings will outlast equipment they connect if properly maintained. Their cost may be spread out over 25 years or more, offering you lowest coupling cost per year!*

In oil fields, steel mills, power plants . . . all through industry . . . cost-wise executives report that *Fast's Couplings,* designed, manufactured and guaranteed by Koppers, are the best insurance against coupling failures! Take a tip from these users who know. Specify Fast's and forget *your* coupling problems!

By specifying Fast's, you get the benefit of Koppers Engineering Service, acknowledged best in the industry. Koppers Engineers, backed by 30 years coupling experience, study your problem . . . then show you *which* Fast's Coupling fits your application, (and more important) *why* you need it!

Only Koppers can offer you this valuable service . . . only Koppers offers Fast's, the original gear-type coupling. Fast's Couplings assure you freedom from expensive coupling failures in your plant because Fast's have no perishable parts to fail!

GET THE FACTS: Mail coupon today for your free copy of the Fast's Coupling Catalog, published by Koppers. Shows how Fast's operate, describes the many sizes and types. Gives full details about Koppers Engineering Service. Send for your copy today.

KOPPERS

FAST'S

THE ORIGINAL GEAR-TYPE

Couplings

BALTIMORE 3, MARYLAND

FREE CATALOG

KOPPERS CO., INC., *Fast's Coupling Dept.,*
251 Scott Street, Baltimore 3, Md.

Please send me a free copy of your Fast's Coupling Catalog.

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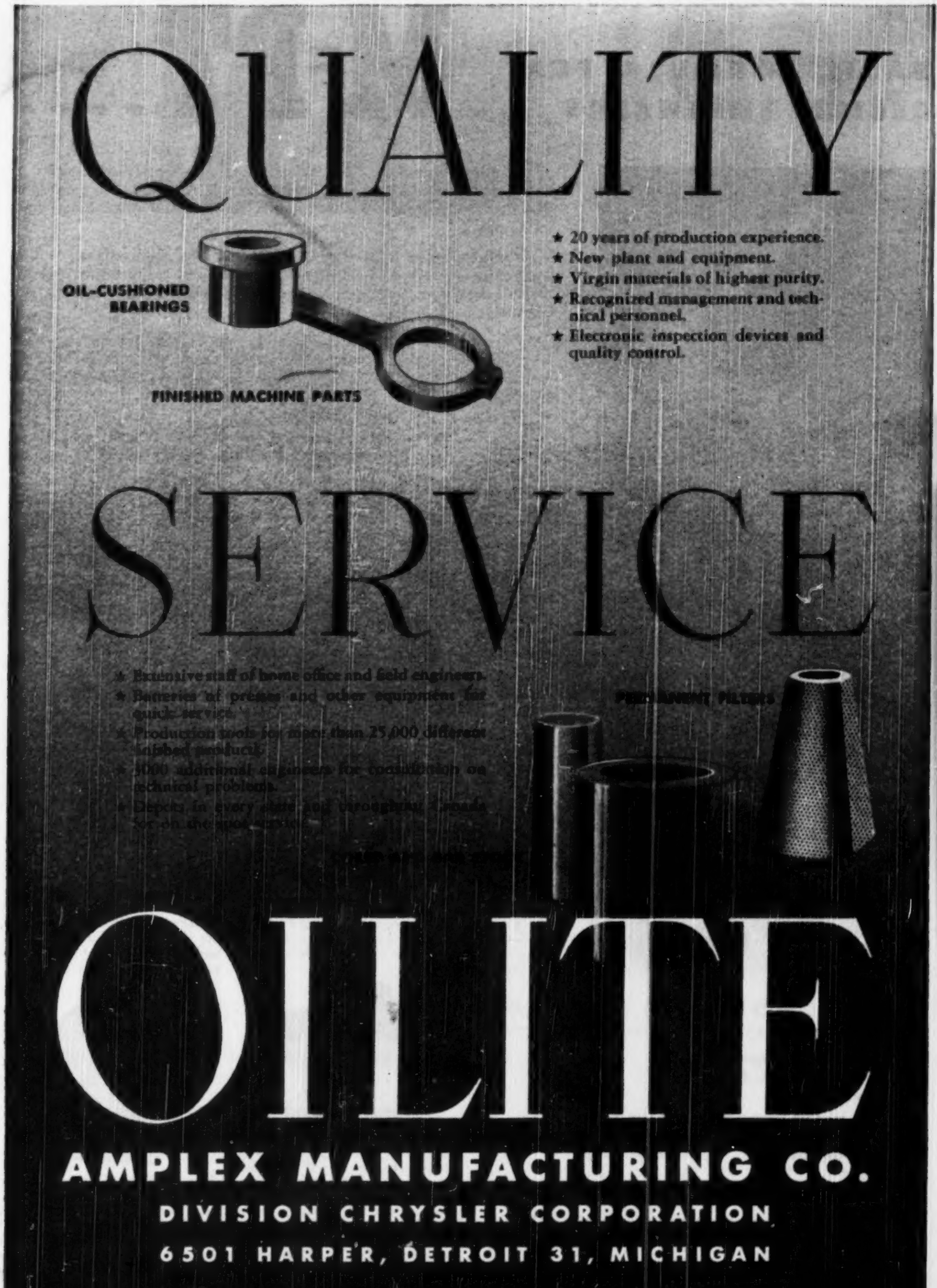
Company..

Address...

City........................ Zone...... State........


ACTION
Wallace Barnes Springs
Bristol Connecticut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OIL-CUSHIONED BEARINGS
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★ 20 years of production experience.
★ New plant and equipment.
★ Virgin materials of highest purity.
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SERVICE
★ Extensive staff of home office and field engineers.
★ Batteries of presses and other equipment for quick service.
★ Production tools for more than 25,000 different finished products.
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AMPLEX MANUFACTURING CO.
DIVISION CHRYSLER CORPORATION
6501 HARPER, DETROIT 31, MICHIGAN

Morse *means* Power Transmission

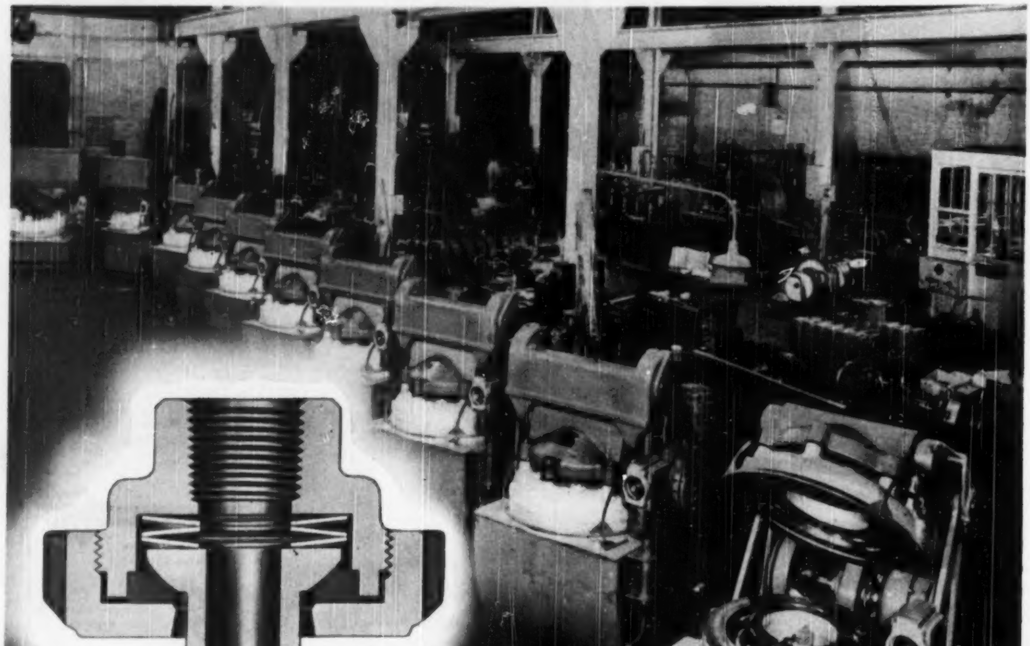
Ask the Morse Man for power transmission information!

100 Morse Branch Offices and Distributors to supply your power transmission demands.

From coast to coast there are more than 100 offices, representatives and distributors of Morse Power Transmission products to give you quick information and service when you want it—where you want it. *Ask the Morse Man first in any case!* Check your classified phone directory under **"Power Transmission"** or **"Chains"** for the nearest Morse Man.

MORSE
MECHANICAL *POWER TRANSMISSION* PRODUCTS

PRODUCTS OF B-W BORG WARNER



Here's an example of how

BARCO CAN PROVIDE IT

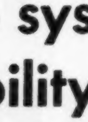
Every tire press in this assembly line is equipped with Barco Swivel Joints which provide the piping flexibility required to open and close the press.

For over 30 years Barco Joints have been serving industry and transportation—each year becoming more and more popular. Today, they are used in almost every kind of job requiring *flexible* fluid-conveying systems. By absorbing strain and stress, by compensating for expansion and contraction, Barco Joints have long been practically indispensable. Write for full information to Barco Manufacturing Company, 1807 Winnemac Avenue, Chicago 40, Illinois. In Canada: The Holden Co., Ltd., Montreal, Canada.

BARCO FLEXIBLE JOINTS

FREE ENTERPRISE—THE CORNERSTONE OF AMERICAN PROSPERTY

Not just a swivel joint ...but a combination of a swivel and ball joint with rotary motion and responsive movement through every angle.

"MOVE IN  EVERY  DIRECTION"

Milwaukee Invites You Again!

ASME

Machine Design Division

Panel Discussion Meeting ~

"The Influence of Customer Demands and Suggestions on the Design and Performance of Capital Goods Machinery"

You dare not miss this excellent opportunity to weigh the experience of American industry and determine future trends. These panels will indicate whether the present pace of research and design is meeting the demands of the user.

Milwaukee consulting engineer, T. F. Eserkaln, left, and ASME Regional Vice President Forrest Nagler, Allis-Chalmers chief mechanical engineer, at work planning this important machine design meeting for industry's leaders.

**Make your hotel reservations now . . .
with James VanVleet,
University of Wisconsin in Milwaukee
Milwaukee 3, Wisconsin.**

Morning, Afternoon, Evening

FEB. 8, 1950

Schroeder Hotel — Milwaukee

★ Highlights:

INSPECTION TRIP

General Motors' A-C Spark Plug Division will play host to guests in the forenoon conducting parties through its new modern factory.

LUNCHEON FEATURES

Machine Design Division chairman, Colin Carmichael, Milwaukee Section chairman, and George Miniberger will extend greetings. Luncheon address "The Effect of War-time Experiences and Discoveries on Future Designs" by ASME director at large, J. B. Armitage, Vice President—Engineering, K&T Corp.

PANEL MODERATORS

Afternoon panel 2:00 to 4:30 PM Walter Harnischfeger, president Harnischfeger Corp. and Francis Trecker, president Kearney & Trecker Corp. Evening panel 8:00 to 10:30 PM, Alex Bailey, president Chicago Commonwealth Edison Co. and Forrest Nagler, chief mechanical engineer Allis-Chalmers Mfg. Co.

SOCIAL

Milwaukee industry will entertain visitors at an informal gathering immediately after the afternoon panel. No dinner plans are scheduled.

FOR THE LADIES

The Milwaukee Section Women's Auxiliary to the ASME will entertain the visiting ladies with traditional hospitality.

As the white outline indicates, a standard unit of much greater frame size would be required to do the work of Speedaire.
The unit operates a Ruggles-Coles Dryer, built by the Hardinge Co., Inc., York, Pa.

SPEEDAIRE ... for 3 years 24 hours a day

THREE years ago, a South Carolina kaolin plant installed one of Cleveland's new fan-cooled Speedaire worm gear speed reducers to drive a rotary kiln. It has operated almost continuously, day and night, ever since, with unimpaired efficiency in spite of the heat and dust.

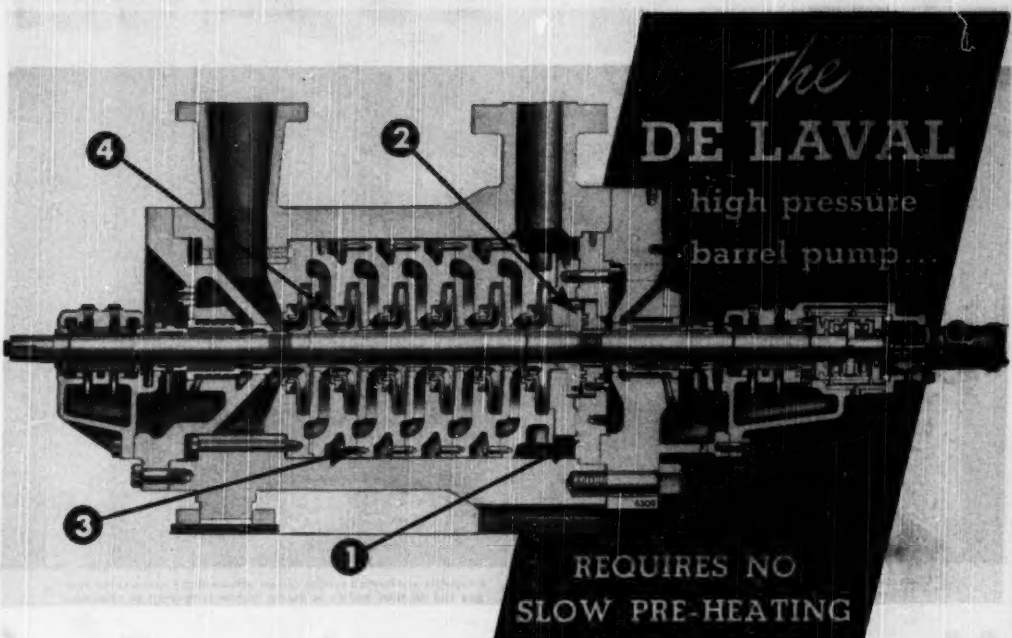
As the photograph indicates, a limited area was available to install a speed reducer, but it was entirely adequate for Speedaire, because it occupies 42% less space than a conventional worm gear drive of comparable capacity. Speedaire also saved $128.50 on initial cost.

Because Speedaire is fan-cooled, it will do more work—will deliver up to *double the horsepower* of standard worm units of equal frame size, at usual motor speeds. It can be installed economically on many applications where other types have been used heretofore—giving you the advantage of a compact right-angle drive. Speedaire gives the same long, trouble-free service characteristic of all Clevelands.

For full description, send for Catalog 300. The Cleveland Worm & Gear Co., 3264 East 80th St., Cleveland 4, Ohio.
Affiliate: The Farval Corporation, Centralized Systems of Lubrication.
In Canada: Peacock Brothers, Limited.

CLEVELAND

Speed Reducers



The De Laval barrel type boiler feed pump is designed to meet the exacting requirements of modern, fast-steaming, high pressure, central stations. When sudden load changes call for water in a hurry this pump can be thrown on the line quickly without slow pre-heating.

Inspect the above drawing and you'll see how the pump has been designed to minimize the effect of sudden temperature change.

❶ **INNER ASSEMBLY** completely free to expand independently of outer barrel.

❷ **AUTOMATIC HYDRAULIC BALANCING DEVICE** with radial throttle balances all axial thrust completely and automatically — unaffected by temperature change.

❸ **INDIVIDUAL BOLTING OF DIAPHRAGMS** lessens temperature strains.

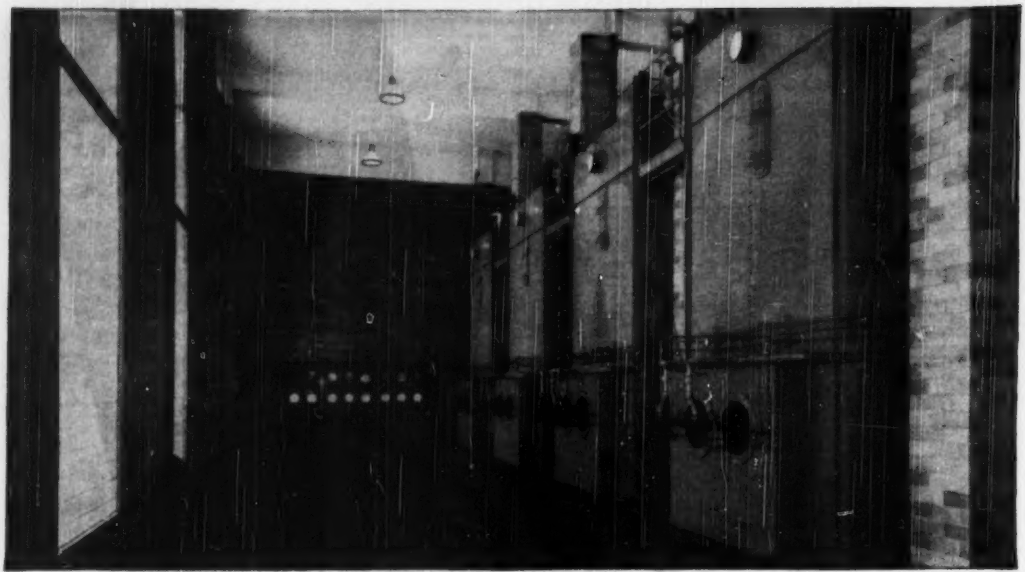
❹ **LARGE CLEARANCE LABYRINTH WEARING RINGS** have ample tolerance for thermal expansion. Action of these rings does not depend upon maintenance of close clearances.

Send for Catalog 1506-7-A

DE LAVAL

DE LAVAL STEAM TURBINE CO., TRENTON 2, N. J.

TURBINES • HELICAL GEARS • CENTRIFUGAL BLOWERS AND COMPRESSORS
CENTRIFUGAL PUMPS • WORM GEAR SPEED REDUCERS • IMO OIL PUMPS



"Efficiency and Cleanliness" are the by-words at the new power plant for Father Flanagan's Boys' Home at Boys' Town, Nebraska. Here a Republic combustion control system automatically operates the four gas and oil-fired boilers to assure maximum combustion efficiency.

More Steam FROM Less Fuel

WITH

REPUBLIC Automatic COMBUSTION CONTROL

Low steam cost is not the result of efficient boiler design alone! It is determined by the degree with which your method of boiler control takes full advantage of those economies which have been "Built In" the boiler and its auxiliaries.

In operating a modern boiler, therefore, a number of repetitive adjustments must be made frequently and practically simultaneously on several units of auxiliary equipment in order to maintain highest boiler efficiency. The difficulty of making the required repetitive adjustments accurately and synchronously by hand at the individual auxiliaries is obvious.

What is needed, therefore, is a method for making and co-ordinating these adjustments automatically from a centralized control point, at the same time permitting the operator to assume manual control at this point whenever necessary or desirable.

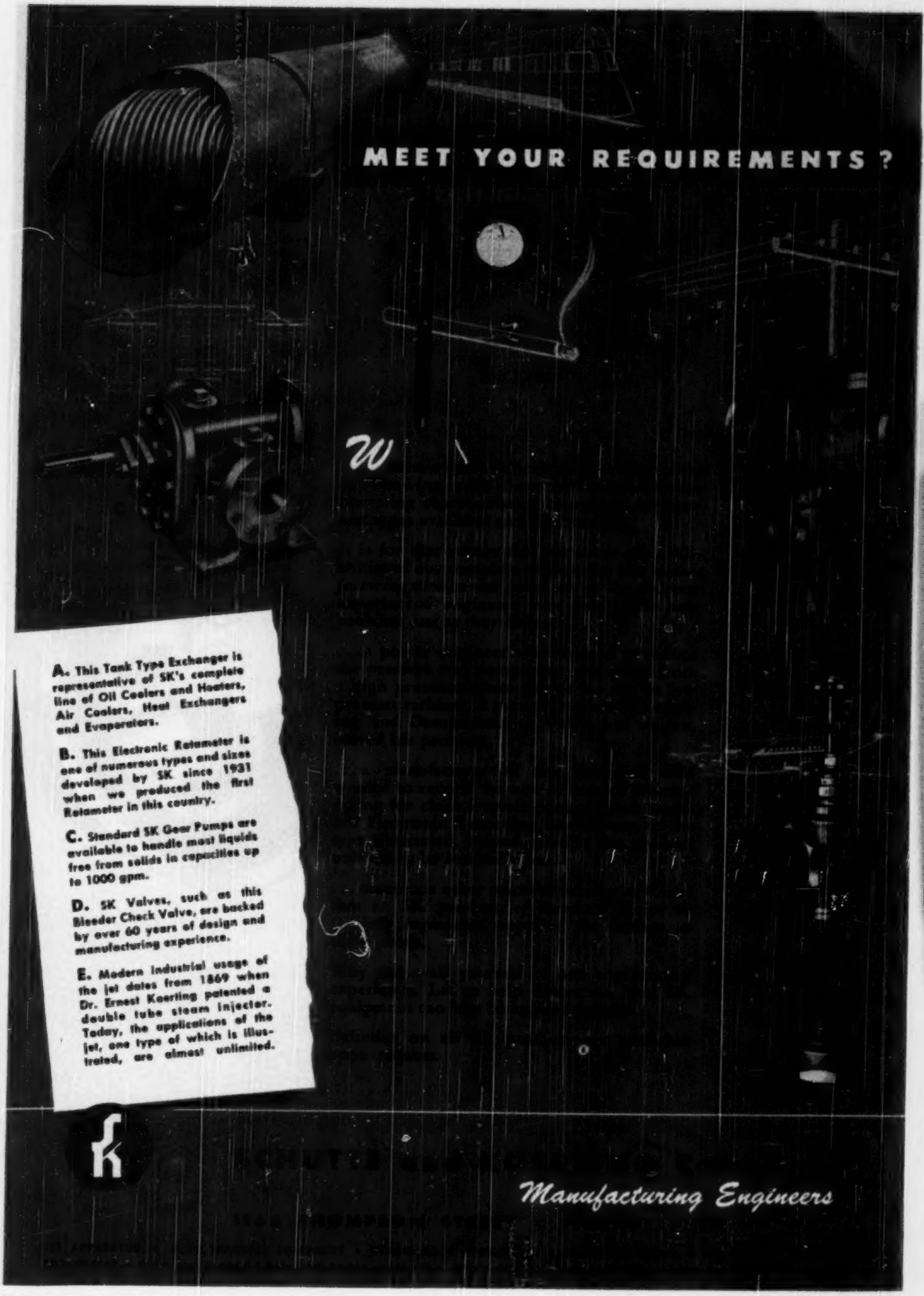
The REPUBLIC combustion control is a unified system controlling simultaneously, in measured quantities and in fixed (adjustable) proportions, the fuel and air input to the boiler. It increases or decreases the fuel and air supply to the boiler in the correct amount to maintain constant steam pressure and in the correct ratio to maintain maximum combustion efficiency.

REPUBLIC combustion control systems are designed and built for all sizes of boilers—all types of fuel firing equipment—all load conditions. They fulfill all the conditions of theoretically perfect combustion control and still meet all the demands of everyday operating requirements, result—lower fuel cost.

WRITE FOR YOUR COPY OF DATA BOOK No. S-21 ON Automatic Combustion Control

REPUBLIC FLOW METERS CO.

2240 Diversey Parkway, Chicago 47, Illinois


MEET YOUR REQUIREMENTS?
W
A. This Tank Type Exchanger is representative of SK's complete line of Oil Coolers and Heaters, Air Coolers, Heat Exchangers and Evaporators.
B. This Electronic Rotameter is one of numerous types and sizes developed by SK since 1931 when we produced the first Rotameter in this country.
C. Standard SK Gear Pumps are available to handle most liquids free from solids in capacities up to 1000 gpm.
D. SK Valves, such as this Bleeder Check Valve, are backed by over 60 years of design and manufacturing experience.
E. Modern industrial usage of the jet dates from 1869 when Dr. Ernest Koerting patented a double tube steam injector. Today, the applications of the jet, one type of which is illustrated, are almost unlimited.
Manufacturing Engineers


MRC
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MRC
the M-R-C "Synthe-Seal" bearing
A standard-dimension ball bearing with a removable synthetic rubber seal for keeping out dirt, grit and moisture and for keeping in lubricant.
MARLIN-ROCKWELL CORPORATION, Jamestown, N.Y.

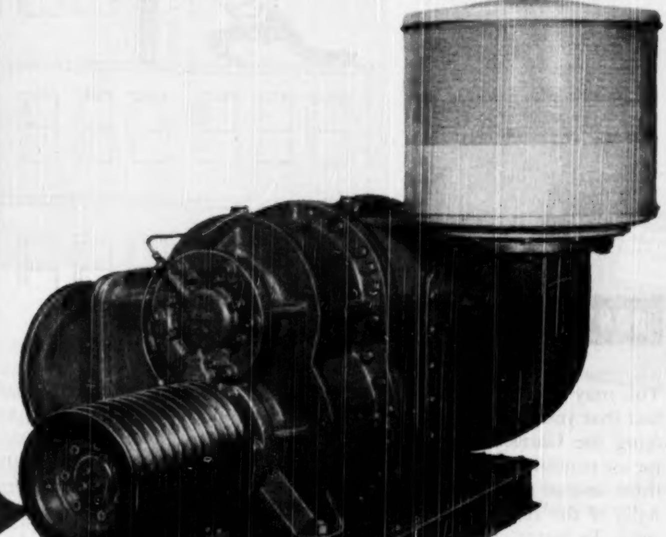

NEW
SERIES 12100*
DROP FORGED STEEL
Vogt
BOLTED BONNET
BOLTED GLAND
150-800 POUND
GATE VALVES
SIZES 1/4" to 2"
*Series 12100
CARBON STEEL { 800 Pounds @ 750° F. / 1500 Pounds Cold Non-Shock
For 150-800 pounds service • Round Bolted Bonnet • Bolted Gland • Gasket or Ground Joint • Outside Screw and Yoke • Renewable Seat Rings • Solid Wedge — Slotted Type • Rising Stem 11½-13% Chrome Stainless Steel Trimmings • Sizes ¼" to 2" inclusive.
HENRY VOGT MACHINE CO. Louisville 10, Ky.
BRANCH OFFICES: NEW YORK • PHILADELPHIA • CLEVELAND • CHICAGO • ST. LOUIS • DALLAS

The STANDARDAIRE *Axial Flow* BLOWER . . . .

Makes RPM=CFM . . . a performance typical of our No. 5 positive displacement blower—suitable for capacities of 800 to 2200 CFM at speeds of 800 to 2200 RPM operating at differential pressures of 2 to 20 p.s.i. The Standardaire No. 5 Blower offers this flexibility of operation plus the desirable characteristics of extremely low noise level and high efficiencies. To insure long service life under continuous operation these features have been built into the modern design Standardaire Blower: accurately generated, screw type rotors . . . shaved helical gears . . . precision, oversize, anti-friction bearings . . . oil pump with filter and strainer . . . three-point mounting. For further details write the Standard Stoker Company, Inc., Dept. A-24, 370 Lexington Ave. New York 17, N. Y.

A UNIQUE PULLEY ATTACHMENT . . .

The Standardaire No. 5 Blower will deliver a cubic foot of absolutely clean air for each revolution of its main rotor. Although direct drive from a motor ordinarily meets requirements, at such times when direct drive cannot be used a novel type pulley may be applied and a wide range of speeds gained. Each speed will give a definite air output to meet exacting demands. Contrary to the usual practice, the pulley is not mounted directly on the blower shaft. It is carried on an extra, built-in bearing which, in turn, is supported within a [illegible] flange mounted on the blower. The pulley is [illegible] through an internal gear type coupling—its bearing receiving positive lubrication automatically from the main [illegible]. This modern design [illegible] pulley eliminates all [illegible] [illegible] Positive Displacement Blower.



THE STANDARD STOKER CO • INC •

A PRODUCT OF

NEW YORK • CHICAGO • ERIE • MONTREAL

Our [illegible] Years in Stoker Manufacture Exclusively, Including 20 Years of SPREADER Stoker Experience IS AT YOUR SERVICE

A pioneer in spreader stoker design and building, we have made applications of RotoStokers to all types and makes of boilers in a wide variety of plants both here and abroad.

STATIONARY GRATE—The Stationary Grate RotoStoker is readily applied to small and medium boilers where no basement for ash handling is provided.

A DOUBLE SAVING

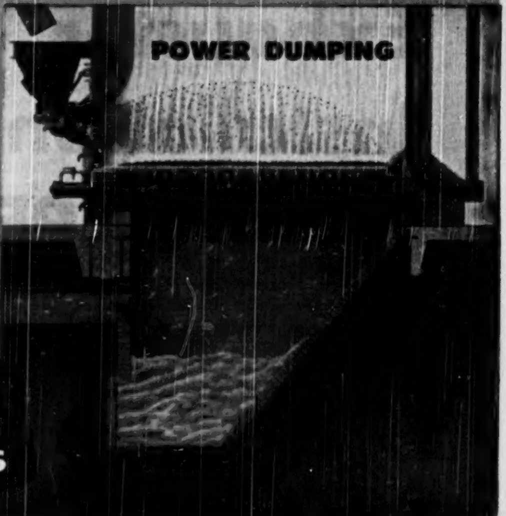
The RotoStoker provides a double saving: Saves first—by increased efficiency. Saves again—because it will burn any kind of Bituminous Coal or Lignite. Users, therefore, buy their coal at *best price advantage*.

HAND DUMPING GRATE TYPE—With the Hand Dumping RotoStoker, a shallow ash pit, as shown, is often sufficient. Ashes are discharged by releasing dumping levers and removed through the ash doors at the front when convenient.

RotoStoker burning rates are higher and will provide you with more capacity. The ability to handle fluctuating loads has made it popular.

The Detroit RotoStoker has distinct advantages over other methods of firing.

As stoker designers and builders of fuel burning equipment exclusively, we recommend in each case the method of firing best suited to your plant and the fuel available.



POWER DUMPING GRATE *—Steam Cylinders provide power for dumping. Each grate section is dumped independently of the others. Balance of the stoker carries the load with uniform steam pressure.*

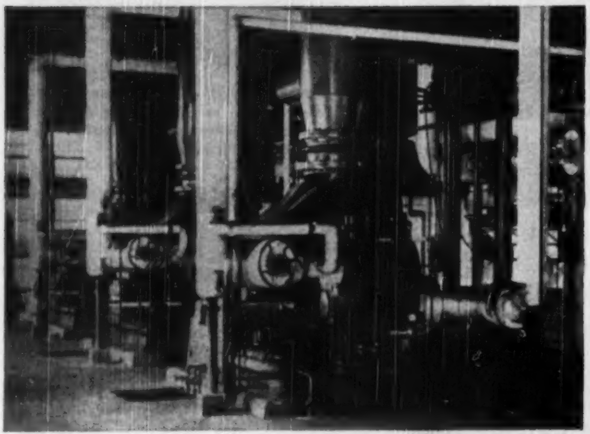
OTHER TYPES AND SIZES OF DETROIT STOKERS FOR EVERY INDUSTRIAL NEED

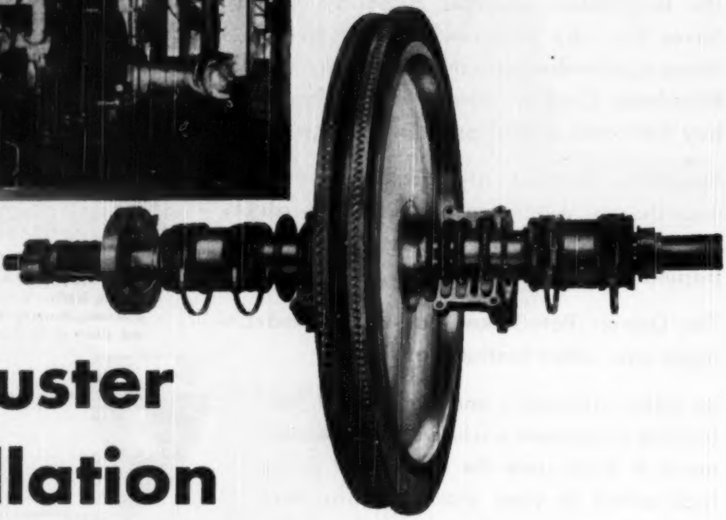
DETROIT STOKERS

DETROIT STOKER COMPANY

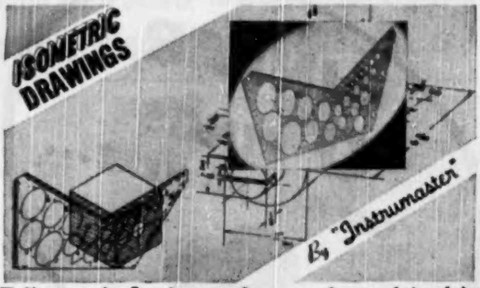
GENERAL MOTORS BUILDING, DETROIT 2, MICHIGAN

Works at Monroe, Michigan: District Offices in Principal Cities






Wickes Type-A
VANANDA



ISOMETRIC DRAWINGS
By "Instrumaster"

SIMPLICITY of DESIGN...

MECHANICAL ENGINEERING

December, 1949 — CARD INDEX — Vol. 71, No. 12

Representatives—Sales Agencies
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OPPORTUNITIES

Positions Open—Positions Wanted—Equipment, Material, Patents, Books, Instruments, etc. Wanted and For Sale

Answers to box number advertisements should be addressed to given box number, care of "Mechanical Engineering," 29 West 39th St, New York 18, N. Y.

POSITIONS OPEN

HYDRAULIC DESIGN ENGINEER

A Middlewest company desires the services of a man thoroughly acquainted with all phases of hydraulic engineering. Must have had at least 5 years' actual experience in the engineering and design of equipment, including hydraulic metal drawing, plastic molding and extrusion presses and controls.

In replying please give full details regarding your experience, background, age and approximate salary requirements.

Address CA-3089,
care of "Mechanical Engineering."

DISTRICT SALES MANAGER

Nationally known power equipment manufacturer offers unusual opportunity for graduate engineer with substantial sales experience in rotating machinery. Position requires background in industrial and municipal contacts. Development of new and potentially excellent territories in south and midwest. Forward detailed resumé of experience indicating past sales record, as well as earnings expectancy. All replies will be held in strict confidence.

Address CA-3091, care of "Mechanical Engineering."

MECHANICAL ENGINEER

For Mechanical Design and Engineering Studies in connection with Electric Utility work. Should have 15 years' experience in similar work.

***Write to:* Mechanical Engineer, Pennsylvania Power & Light Company, Allentown, Pennsylvania.**

MECHANICAL ENGINEER—wanted for plant layout, machine design and process engineering, capable of design and drafting work. Permanent position with advancement for qualified man. Paper or board mill experience desirable but not essential. Give complete information in first letter including references and salary requirement. Address CA-3072, care of "Mechanical Engineering."

ASSISTANT PLANT ENGINEER—desire a mechanical-electrical engineer with from five to ten years experience in the utility and instrument fields as executive assistant to plant engineer. Will exercise supervision over chief electrician, power plant superintendent, process boiler room superintendent and instrument department. No drafting other than pencil sketches and one-line diagrams required. Outstanding contributory retirement and insurance plan with free medical and hospitalization services. Located in a Mississippi town of 30,000. Salary commensurate with education and experience. Please submit complete data along with recent photograph and expected starting salary. Address CA-3094, care of "Mechanical Engineering."

DESIGN ENGINEERS—Civil, Mechanical and Structural. Openings for Qualified men with industrial experience in above lines. Give complete information regarding background, age, references, and salary requirements in first letter. Address CA-3095, care of "Mechanical Engineering."

RATES Classified Advertisements under this heading in MECHANICAL ENGINEERING are inserted at the rate of $1.25 a line. $1.00 a line to members of ASME. Seven words to the line average. A box number address counts as one line. Minimum insertion charge, 5 line basis. Display Advertisements carried in single column units of multiples of one inch at flat rate of $20 per inch per insertion. Maximum size: 1 column, 10 inches deep; 2 columns, 5 inches deep. Copy must reach us not later than the 10th of the month preceding date of publication.

DESIGNER OR DRAFTSMAN—experienced in time clock mechanisms. Old, medium sized company, near N.Y.C. Address CA-3103, care of "Mechanical Engineering."

VALVE DESIGNER—For steadily growing Chicago area company. Prefer man with design experience in the steel valve field. This is a board position. Salary commensurate with ability and experience. Address CA-3104, care of "Mechanical Engineering."

ASSISTANT TO CHIEF ENGINEER—Excellent opportunity, with a progressive company in the Chicago area, for a mechanical engineer experienced in valve design. Send details of qualifications. Address CA-3105, care of "Mechanical Engineering."

POSITIONS WANTED

POWER PLANT or UTILITIES ENGINEER—40, B.S. in E.E. and M.S. Registered Professional and Licensed Operating Engineer. Diversified experience in operation and supervision of steam and generating plants. Experience includes maintenance, planning, estimating, some layout and supervision of construction. Sound knowledge of refrigeration and water plants. Ten years in supervisory or administrative capacity, five of them in power plants. Desires administrative position with a utility or industrial plant. Address CA-3090, care of "Mechanical Engineering."

PROFESSOR—with exceptional academic, research and teaching qualifications seeks highly responsible post, preferably in applied mechanics, structures or machine design. CA-3095, care of "Mechanical Engineering."

JET ENGINES—Physicist (Sc. D., MIT) 11 years' experience in applied physics, measurement and control in thermal, electric, electronic, gas handling, optics. Would like to enter jet engine field. Join group working research, design, development, testing. Address CA-3097, care of "Mechanical Engineering."

MECHANICAL ENGINEER—Graduate of recognized school, registered, age 35; 5 years' plant engineer in charge of operating, maintenance and plant expansion; 4 years' equipment design and plant layout; total 13 years' industrial experience in engineering. Address CA-3098, care of "Mechanical Engineering."

DIESEL ENGINEER—B.S.M.E., Graduate work in Diesel engineering at the Penn. State College. Six years' experience in automotive and marine engine repair. Knowledge of fuel injection systems, mostly Bosch pumps and unit injectors. Mainly interested in engine design and testing. Address CA-3099, care of "Mechanical Engineering."

MECHANICAL ENGINEER—20 years' experience in design, development and production manufacture of aircraft accessories and equipment, has spare time to devote to similar projects. Address CA-3101, care of "Mechanical Engineering."

MECHANICAL ENGINEER—B.S. State U. of Iowa '48. Age 25, single, excellent trainee material, some experience in selling and drafting. Position with future first consideration. Will relocate or travel. Address CA-3102, care of "Mechanical Engineering."

ELECTRO-MECHANICAL ENGINEER—B. Aero. E. 1948, B.E.E. 1950. 2 years Navy and Industrial electronic tech., 1 year M.E. development servo-controlled aircraft radar. Desire servo, instrument, TV or tech. writing position. N.Y.C. area. Address CA-3106, care of "Mechanical Engineering."

If you desire capital or have it to invest; if you have a patent for sale or development; if you have on hand used machinery for disposal, or if you want such equipment; if you have copies of publications, or a set of drawing instruments to dispose of; if you need help or want a position, in fact, anything to be offered that somebody else may want, or anything wanted that somebody else may have—

Use a Classified Advertisement in

MECHANICAL ENGINEERING

for Quick Results

It will pay you to watch the announcements on these pages for an opportunity that you may be looking for or one that may be of interest to you.

EMPLOYMENT AGENCIES AND SERVICE BUREAUS

EXECUTIVES, ENGINEERS, DESIGNERS, SPECIALISTS—Our staff—technical graduates—serving both employer and applicant 20 years—No fee until placed—Bradley Placement Service, 555 Leader Building—Cleveland 14, Ohio.

SALARIED POSITIONS $3,500-$35,000. If you are considering a new connection, communicate with the undersigned. We offer the original personal employment service (40 years' recognized standing and reputation). The procedure, of highest ethical standards, is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Send only name and address for details. R. W. Bixby Inc., 115 Dun Bldg., Buffalo, N. Y.

SALARIED PERSONNEL $3,000—$25,000

This confidential service, established 1927, is geared to needs of high grade men who seek a change of connection under conditions, assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited.

JIRA THAYER JENNINGS
Dept. J, 241 Orange Street, New Haven, Conn.

REPRESENTATIVES AVAILABLE

MANUFACTURERS REPRESENTATIVE—well established in Southern California desires an additional industrial line. Now selling air and hydraulic controls and equipment. Address CA-3093, care of "Mechanical Engineering."

BUSINESS OPPORTUNITIES

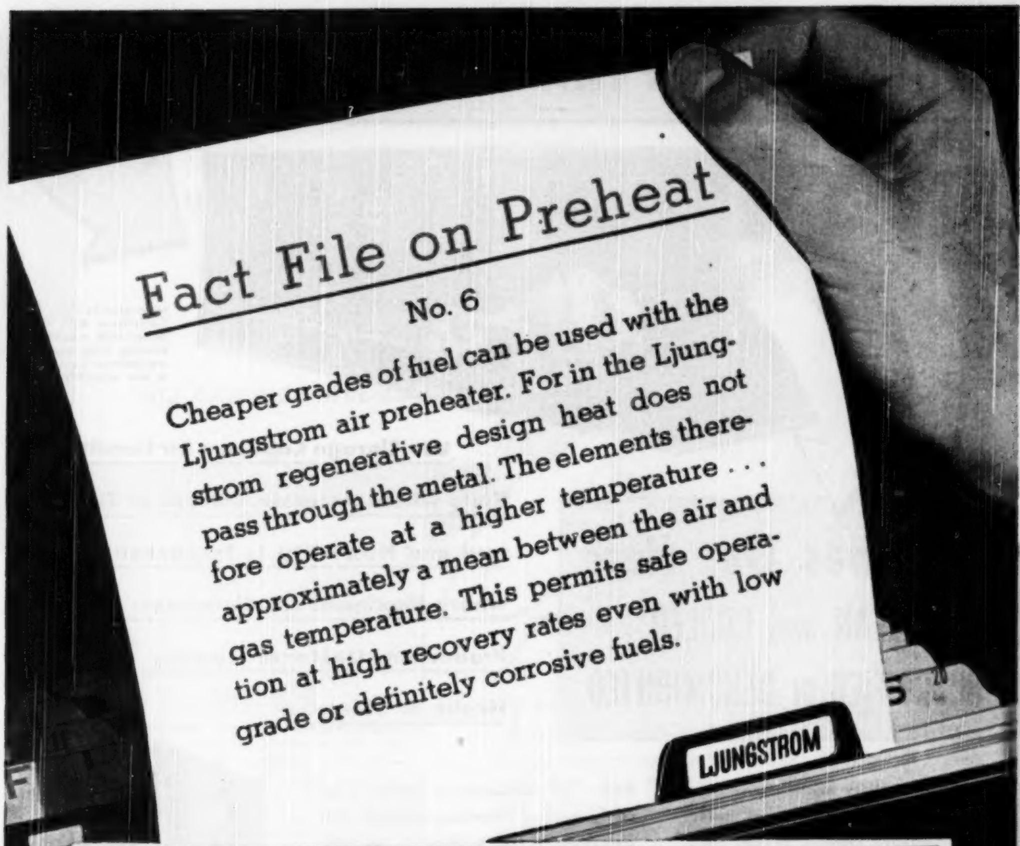
AIR MAIL TRACING SERVICES—send your engineering drawings to us for accurate tracing by experts. Quick deliveries at low costs. Arthur Willetts, A.M.I. Mech.E., 48 Holly Avenue, Walton-on-Thames, Surrey, England.

LONG ESTABLISHED COMPANY—operating modern foundry and machine plant, desires new products to manufacture and market. No financing required. Address CA-3092, care of "Mechanical Engineering."

Index To Advertisers

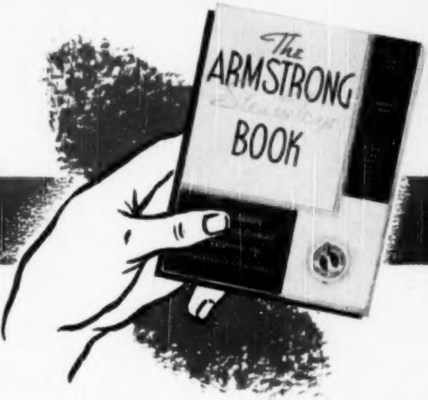
KEEP INFORMED—Pages 39-56 ENGINEERING SERVICE—Page 92 OPPORTUNITIES—(classified ads) Page 91

ENGINEERING SERVICE


Fact File on Preheat
No. 6
Cheaper grades of fuel can be used with the Ljungstrom air preheater. For in the Ljungstrom regenerative design heat does not pass through the metal. The elements therefore operate at a higher temperature . . . approximately a mean between the air and gas temperature. This permits safe operation at high recovery rates even with low grade or definitely corrosive fuels.
LJUNGSTROM

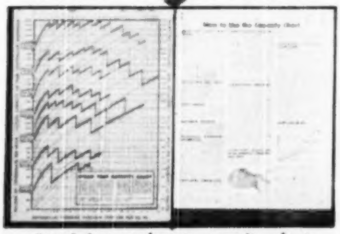
"You can engineer any trapping job with this book"

YOU CAN'T GO WRONG



Physical data and prices on all sizes and types of Armstrong steam traps.

How to calculate condensate loads and select traps for all classes of equipment.



Actual hot condensate capacity chart for every Armstrong trap, recommended safety factors and specific recommendations for many types of equipment.

THERE is no guess work about steam traps or steam trap selection when you have the 36-page Armstrong Steam Trap Book to work with. You don't waste money on traps that are too big for the job. You don't get inefficient drainage with traps that are too small.

This book explains the design, operation and advantages of Armstrong steam traps, specifies materials used, gives complete dimensional data, includes list prices, actual capacities under working conditions. There are 10 pages of tabular and technical data explaining how to calculate condensate loads and select the correct trap for the job, complete instructions on installation and maintenance. The Steam Trap Book also describes Armstrong traps for draining moisture from compressed air systems, Armstrong steam humidifiers for adding moisture to dry air and Armstrong non-condensable gas purgers for removing air from refrigeration systems.

Anyone is welcome to a copy of this useful guide to good trapping practice. Send for yours today.

ARMSTRONG MACHINE WORKS
894 Maple St., Three Rivers, Mich.

ARMSTRONG STEAM TRAPS

How TIMKEN® bearings hold a spindle to its promise

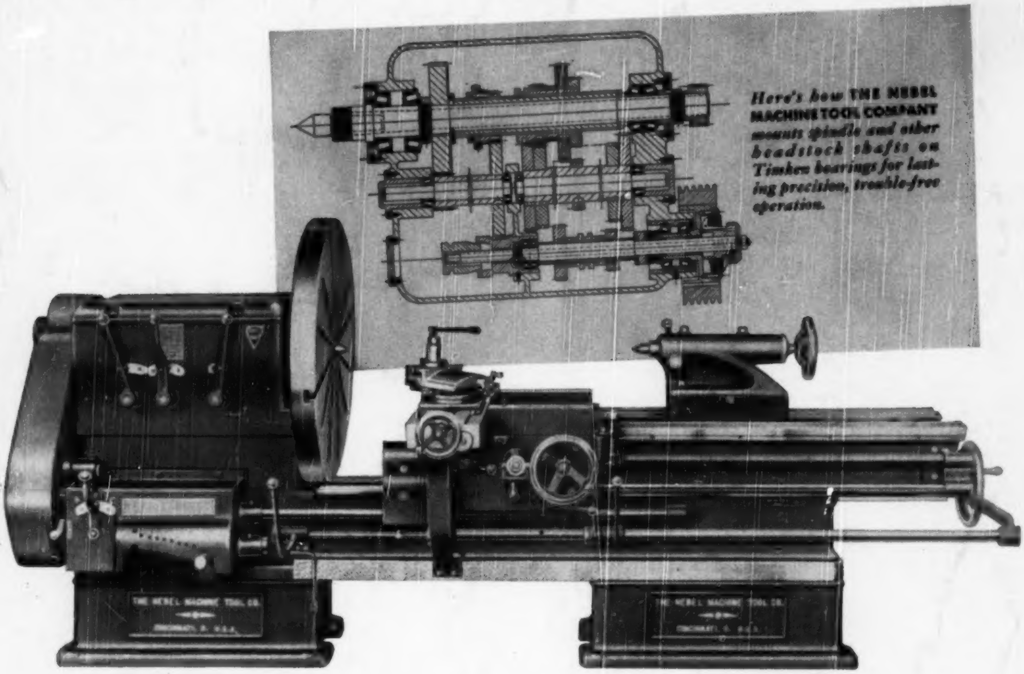
TO insure year-in, year-out precision in this extension bed gap lathe, The Nebel Machine Tool Company mounts the spindle and other headstock shafts on Timken® tapered roller bearings.

Timken bearings hold shafts in rigid alignment, keep gears meshing smoothly. The line contact between rolls and races means extra load carrying capacity. And due to their tapered construction, Timken bearings take both radial and thrust loads; minimize deflection and end-movement.

The smooth finish and true rolling motion of Timken bearings insure frictionless operation. Made of Timken fine alloy steel—best ever developed for tapered roller bearings—Timken bearings normally last the life of the machine.

Remember, no other bearing gives *all* the advantages you get with Timken bearings—backed by 50 years of bearing research and development. That's why it pays to make sure you have Timken bearings in every machine you manufacture or buy. Always look for the trade-mark "Timken" on the bearings. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



POSITIVE ROLLER ALIGNMENT

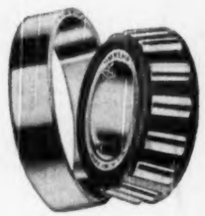
Wide area contact between roll ends and rib of the cone prevent Timken roller bearings from skewing. Result: bearings roll easier, last longer.

The Timken Company is the acknowledged leader in: 1. advanced design; 2. precision manufacture; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ◯ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL AND THRUST — LOADS OR ANY COMBINATION